



March 1990

Vol. 3

Nº 6

Price £1.80

Archive

The Subscription Magazine for Archimedes Users

ARM Code Speed Optimisation

String Sorting using OS_HeapSort

Writing RISC-OS Applications – 2

Introduction to 'C' – Part 5

Reviews: Archimedes First Steps, Trivial Pursuit,
MultiStore, Spacetech Satellite System, Watford
Handscanner

Plus new regular feature – SCSI Column

RISC versus CISC

Archimedes owners used to be able to say that their computer was the fastest micro-computer in the world. Things have moved on and we find ourselves apologising for the slow speed of the PC Emulator. However, with the falling prices and rising speeds of ARM3 upgrades, we can begin to go on to the offensive again. For under £2,000 (just!) you can have a 410/1 with ARM3 that will knock spots off its rivals!

Six of the best!

By popular request, as they say, we have asked Karen Dunkley and Phil Colmer to give us the best downloads from the Archive BBS and SID, respectively, to distribute through the Shareware system. So far, we have generated one "Best of Archive BBS" disc (Shareware 19) and two "Best of SID" discs (Shareware 20 and 21) and one or two bits from SID have gone on our first DTP disc (Shareware 22). Many thanks to Karen and Phil! (Phil sent us 8 discs full, so there will be more to come – check the price list for details.)

Growing steadily

The Archive subscription list is growing very steadily at the moment. If it continues at the present rate, we will have over 6,000 members by the end of the year. This is due, in large measure, to the quality of articles and hint & tips etc. that you, the readers, send in and also to the atmosphere of mutual help which (again) you, the readers, have generated. Thank you very much for all your efforts. I hope you continue to enjoy reading Archive Magazine as much as we enjoy producing it.

With best wishes,

A handwritten signature in black ink, appearing to read "Paul B.", is written below the author's name.

Government Health Warning – Reading this may seriously affect your spiritual health.

I'm not trying to criticise other people's religious views but I met a man the other day who belonged to a group which seemed to have some very strange views. He said they believed in love and peace etc and yet the badge he was wearing had a gallows on it! I asked him about his badge and he said there was nothing unusual about it – they even have a gallows on the wall of their worship centre. He told me that it was because their founder had been executed and that, because his death was so important to them, they have a regular ritual meal in which they 'celebrate' his death.

Actually, it wasn't a gallows with a noose – it was something far worse that gives a slow, lingering, painful death. The victim was actually nailed to a sort of wooden cross until he died. It seems a funny thing to celebrate. They even have a special celebration on the anniversary of his death – Good Friday. Sounds very strange to me! I wonder what they do on Easter Sunday!??

Archive

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Products Available

- **A3000 5.25" interfaces** – It is possible to fit some of the 5.25" interfaces that were designed for the A300/400 series machines into an A3000, but the mechanical arrangement is never ideal. Watford and Dudley Micro Supplies now do interfaces specifically for the A3000. I have not yet seen the Watford one. The Dudley Micros one is OK except that it consists of an external plastic box with cables coming out between the back plate and top plate of the computer which might cause the cables to be cut into by the metal backplate.
- **A3000 Analogue Port/User Port** – Schools, amongst others, will be pleased to hear that Morley Electronics are now selling a minipodule for the A3000 which includes a user port and an analogue port manufactured to Acorn's specification and fully compatible with the old BBC Micro in terms of the OSBYTE commands. What is more, it has a connector for I^C devices which opens up all sorts of possibilities for interfacing to various other devices. The price is £69 + VAT or £72 through Archive.
- **A3000 external 3.5" drive** from Morley Electronics. These are now available from stock at the Archive price of £125. They are not, as we first thought, dual drives. It consists of an interface and a single 3.5" drive in a dual box. You take the internal drive out of the computer, install the interface instead of it and put the drive into the external box making it into the dual drive as shown in Morley's advert! Sorry for the confusion but this arrangement is better, if you think about it, since it gets away altogether from the Amiga-style side-entry drive. A question was raised about preserving the warranty, but since the drives are supplied to Morley by Acorn I don't see that there should be any problem.
- **A3000 memory prices falling** – We have arranged a special price for Archive subscribers for memory upgrades for the A3000. The 1M and 3M upgrades are £125 and £350 respectively including VAT and carriage. (The make of ram depends on what supplies we can get at the time – could be Computerware, Morley or Watford, but at that price, who's complaining?!?) Note though that this is a limited offer, while stocks last. There are strong rumours of a rise (yes, a rise!) in the price of ram over the next few months.
- **Acorn Midi Software updates** – Acorn have improved and added features to the software on their three Midi products: A3000 user port & midi podule, A300/400 midi podule and the midi add-on to the I/O podule. The new software will be going into all the podules currently in production but the new ROMs and manuals are available for existing owners as upgrades with product codes AKA 54, AKA55 and AKA56 respectively at prices of "around £10, £15 and £12 respectively".
- **I/O podule software improved** – If you buy the AKA56 upgrade to the software for the midi add-on to I/O, you will find that the new ROM contains improved code for the I/O itself. If you have experienced problems with the I/O card, such as problems with interrupt handling, this ROM at "around £12" should solve the problem.
- **Another ARM3 board** – A third manufacturer is producing ARM3 upgrades – Watford Electronics. The good news is that at £349 +VAT, the price is somewhat lower than Aleph One's price of £599 +VAT. The board is similar to the one produced by Aleph One and again needs the MEMC1a upgrade fitting to A310's and old A440's, but Watford will supply the MEMC1a upgrade with the ARM3 for £49 +VAT. The bad news is that, as with Gnome Computers' ARM3 board, they are not yet available in quantity. Aleph One do not seem to have the same supply problem but no doubt the cheaper versions will become more numerous.
- **Archimedes First Steps** – At last, a beginners' book about the Archimedes. £9.95 from Dabhand Computing (£9 through Archive). See the review on page 17 for details
- **Best of Archive BBS downloads** – Shareware 19 is now available. It features some of the best programs downloaded from the Archive BBS. It includes the following: home accounts application, hypertext based application, scientific calculator, dustbin, two file utilities, disassembler, RS423 downloader, othello, space invaders, a text adventure, and little desktop demo. Thanks, Karen!

- **Best of SID downloads** – Shareware 20 is now available. It is the first of a series of discs of the best programs that can be downloaded from Acorn's SID database. Thanks to Phil Colmer!

It contains four demos, two games (battlestar & solitaire), Arcterm 3.11, FormEd, DFSstoADFS, ModeExtend, Sparkplug, Trash, VDUsaver, keyboard=mouse utility, plus four C utilities. At least two more 'Best of SID' discs will follow shortly. *STOP PRESS Sharewares 21 & 22 ready – No spare space here, so see page 60 for details!*

- **Faster and cheaper ARM3's** from Aleph One – (perhaps that should read "faster OR cheaper").

ARM3's are now available at 30MHz, instead of 20MHz as earlier versions, at the same price of £595 + VAT. (£650 through Archive) While stocks last, the 20MHz version will be available at £495 + VAT from Aleph One. If you want your 20MHz version upgrading to 30MHz, Aleph One will replace the chip and the clock for you for £50 + VAT (thus making a 20MHz chip available for someone else!). Don't get too excited though – you will find that upgrading from 20 to 30 MHz does not give a further 50% speed increase. From figures which Aleph One gave me, it looks more like about 28% in mode 0 or 25% in mode 27. If you are not sure what speed your chip is, the crystal on the p.c.b. is 40MHz for the 20MHz chip and 60 for the 30MHz chip. Also, the chips that are capable of running up to 30MHz are black as opposed to the slower versions which are grey with a purple middle. Electronics experts amongst you may be tempted to try speeding your chips above the quoted rates and you will probably find that they will still work. However, at higher temperatures they may begin to malfunction, so you trade off speed against reliability.

(For the PC-minded among you, the Norton index rises from 1.0 on an 8MHz ARM2 to 3.2 on a 20MHz ARM3.)

Sadly, the ARM3's are not compatible with the Acorn f.p.u. This is not bad design on Aleph One's part but just because of the different pin-outs of the ARM2 and ARM3. So, if you want speed increase for doing calculations, you have to choose which is going to be better for the sort of work you are doing. In order to help you judge which will be best, Aleph One provide a program speed testing service. You

can send them a typical program on a disc and they will run it with and without the ram cache on the ARM3 so that you can judge the likely speed increase. In order to help Aleph One provide that service without too much hassle on their part, they lay down certain specifications about the program to be tested. If you are interested, send them an S.A.E. for a specification sheet.

- **Confusion over Confusion** – Confusion from Cambridge International Software is the same program as Fireball II as reviewed by Dave Bilsby last month, page 41. It is available now through Archive for £10.

• **Modem prices down** – We've managed to do a better deal on the two modems we sell. The SM2400 modems is down from £235 to £210 and the WS3000 V22bis from £350 to £310. Modem cables, which were proving very difficult to get hold of, are no problem now because we are getting them made locally using better quality cabling and sockets at the same price of £10.

- **Outlines Fonts** – Ian Copestake Software are due to release sets of outline fonts for use with RISC-OS. Symbol sets for mathematics and languages will be included. See the advertisement on page 48 for more details.

• **PD software** – A couple of new sources of Archimedes PD software have come to our notice. The first is Sandie the Walrus, alias Alexander Goh, who has just published his first PD disc. It contains FWPlus file converter, RISC-OS application maker, Babyblues, Battleships, ChangeFSI (from Acorn), scientific calculator, Projector (from Ace), horizontal text scroller, Settype, Solitaire, Sticky-BD, Soundtracker and Wanda. This first disc is available now from Sandie the Walrus, 12 Mornington Road, Radlett, Herts, WD7 7BL.

Also, Peter Sykes has set up a huge catalogue of PD software: 38 straight Archimedes discs at £2.50 each plus 15 PC emulator PD discs at £3 each. Send an S.A.E. for a list to: Peter Sykes, 96 Lanehouse Road, Thornaby, Cleveland, TS17 8EA.

- **Pipedrivers** from Ian Copestake Software enhance your ability to control a printer from Pipe-dream and make scientific and foreign language word-processing a possibility. They provide

symbol sets and different typefaces for a range of printers. Contact Ian for further details.

- **T_EX for the Archimedes** – Donald E Knuth's text formatting program T_EX is now available on the Archimedes, including the A3000. It allows complex mathematical and scientific texts to be typeset and printed on a range of printers. T_EX is available from TooLs GmbH for £99 (£69 for education). They also have various typefaces available for different printers. Send to TooLs GmbH for details.

- **Trivial Pursuit** – Domark have now released their Trivial Pursuit game, £29.95 (£27 through Archive). It's the real thing with TP board and animated question master. See review on page 41.

- **Watford ram prices down** – The price of the ram upgrades for the A300 series have gone down to £285 and £499 (+VAT) for the 2M and 4M upgrades respectively. (Note that the 2M board is not directly upgradable to 4M.) The price of their A3000 boards has also fallen to £129 and £349 (+VAT) for +1M and +3M respectively. (But see the special offer price on page 2.)

Important note: In the next few months, the price of ram is very likely to be going back up again due, so I am lead to believe, to surcharges levied by the E.E.C. on Japanese imports. If you are waiting for the prices to go down further before you buy your upgrades, you may get caught out. I cannot make any guarantees that they won't drop further, but I would very much doubt it. This applies to all memory upgrades.

- **Z88 A Dabhand Guide** – £14.95 from Dabs Press (£14 through Archive). See the review on page 60. (In case you are wondering why we deal with Z88 when we say we are a 'pure' Archimedes magazine, it is because we consider the Z88 to be a peripheral to the Archimedes!) **A**

Products to come

- **DTP packages** from Beebug and Clares. Beebug are saying that their "Ovation" should be ready in two to three weeks (i.e. third week in March at the latest) and Clares say their "Tempest" will happen at the beginning of April.
- **Hypercards abound** – another new "hyper-

media" system has been announced by Relational Engineering. InterLink at £99.95 inclusive allows you to combine text and images in a card format, different cards being linked by clicking on the relevant part of the visible card. For more details, see the advert on page 5.

- **Tabs** – a new 3D design tool with a difference, from TAP Consortium, is due for launch in May. It provides a 2D edit window and a 3D view, continuously updated. The new idea is that, having created your object, the computer 'unfolds' it to provide you with a 2D sheet from which you can make up a model of the object in cardboard or whatever. Like Arcol, their 256 colour art package, Tabs will be fully networkable and will be sold either on a one-off basis or with a site licence.

Review Software Received...

Apart from reviews already written, we have received review copies of the following: Knowledge Organiser, Chaos (requires Numerator), Book-Binder, Holed Out Designer, Mind-warp, !FontFX, Truecopy, Armatron, Noah Tools #2. **A**

Science Frontiers software...

First Word Plus Extended Dictionary

- * **80,000 word Main Dictionary**
- * **Specialised Supplementary Dictionaries**

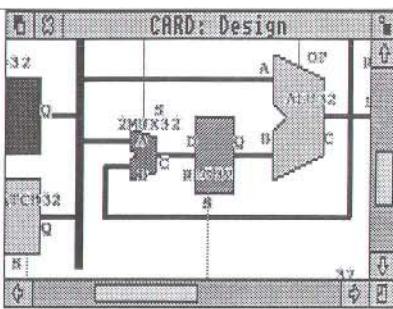
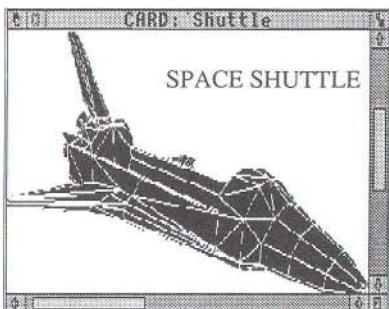
(Computing Terms, Proper Names, Geographical Locations)

£6.95 inclusive

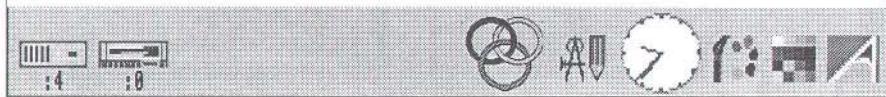
Order from: Science Frontiers
7 Porthill Court
Aberdeen
AB1 1DU.

InterLink

An object-oriented Hypermedia system for the Archimedes



Interlink is a powerful hypermedia system which allows you to organize diverse information. The basic unit of storage is a card which can contain text combined with graphical information from paint packages, digitisers and CAD systems. Cards are grouped together in stacks. Any object in a card can be 'linked' to any card in any stack allowing a network of information to be created. Furthermore, the information in this network can be retrieved by simply clicking on an object.



Features:

- Multiple views on multiple stacks
 - Any combination of text and graphics
 - Transfer objects from other applications
 - Background cards provide inheritance
 - Templates for creating forms
 - Any object can link to any card
 - Links operate over multiple stacks
 - Automatic map generation
 - Interactive on-line help with documentation
 - WYSIWYG text editing and formatting
 - Multi-level protection and locking of stacks
 - Stacks and cards can be viewed across Eonet
 - Create rolling-demos and tutorials
 - Cards have standard sizes i.e A0 - A5

- Objects are compatible with !Draw,!Paint etc
 - Extensive editing facilities for text and graphics
 - Powerful entry facilities for text and graphics
 - Emulate regular Database features
 - Time and calendar functions for management
 - Can be used to generate reports & presentations
 - Ideal as a project management tool
 - Distributed filing system for 'Doomsday' projects
 - Programmable links for application generation
 - Caching system minimizes memory usage
 - Explicit control over windows for customization
 - Intuitive interface using RiscOs methodology
 - Will run on any Archimedes with 0.5M or more
 - Hard copy via standard RiscOs printer drivers

Write or call for more information on this exciting new product

Relational Engineering

53 Severn Street, Middlesbrough TS4 2AY (0642) 613641

Price £99.95
(inc. VAT & carriage)

16 bit SCSI



Oak's high speed 16 bit SCSI podule offers a new level of performance for the entire Archimedes range (including the A3000) with data transfer rates of up to 1.4Mb per second, a considerable increase over both ST506 and 8 bit SCSI controllers. Up to 2 Gigabytes of winchester storage may be fitted per machine, and seven SCSI devices including 4 winchesters may be attached to the card.

The card provides a new filing system 'SCSIFS', and an icon and filer for the Risc OS desktop. It can work in tandem with ADFS winchesters, and is compatible with the PC emulator. Low level (SWI) support is provided for other SCSI devices (e.g. tape streamers, CD ROMS etc.)



Internal winchester kits are supplied as 'plug in and go' units, with all necessary cabling and mounting hardware, and external drives are supplied in sturdy metal cases, colour matched to the Archimedes, and have their own power supply and fan. External drives are also suitable for the A3000.

A comprehensive manual with easy to follow fitting instructions is provided with each system, along with a versatile formatting and utility program. Oak SCSI drives may be write protected for security.

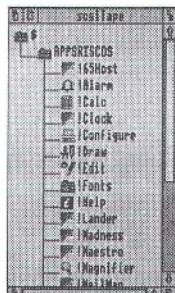


All Oak SCSI winchester drives are subjected to rigorous quality control procedures, and each drive comes with its own test certificate.

Internal Drives (inc. SCSI card)	External Drives (inc. SCSI card)
20Mb (HDINARC20SC)	£375.00
20Mb (HDINARC20SC)	20Mb (HDEXARC20SC) £353.00
45Mb (HDINARC45SC)	£495.00
45Mb (HDINARC45SC)	45Mb (HDEXARC45SC) £655.00
70Mb (HDINARC70SC)	£895.00
70Mb (HDINARC70SC)	70Mb (HDEXARC70SC) £1055.00
100Mb (HDINARC100SC)	£1274.00
100Mb (HDINARC100SC)	90Mb (HDEXARC90SC) £1249.00
200Mb (HDINARC200SC)	£1666.00
200Mb (HDINARC200SC)	135Mb (HDEXARC135SC) £1625.00
SCSI Card (SCSI1ARC)	£199.00
SCSI Card (SCSI1ARC)	170Mb (HDEXARC170SC) £1850.00
P&P internal drives card	£199.00
P&P internal drives card	330Mb (HDEXARC330SC) £2845.00
P&P internal drives	£15.00
P&P external drives	£15.00

16 bit SCSI Controller Card and High Speed Winchester Drives

Tape Backup



Oak SCSI tape streamers, available in 60Mb and 150Mb capacities are the ideal means of backing up large amounts of data. Using 'DC600' type data cartridges and high quality tape drive units, Oak tape streamers provide a reliable insurance against data loss.

Multi-tasking, window software allows information to be backed up from any Archimedes filing system.

Restoring data from tape is simple. A tree viewer of the directory structure stored on the tape, or a 'filer' type display can be shown in a window, and then the files to be restored can be simply 'dragged' with the mouse to the destination filing system, or even into an application!

Unattended backups may be triggered on a regular basis using the built-in automatic backup facility. Prompts to prevent accidental overwriting of existing files may be given during a restore as required.

Note: An Oak SCSI controller card is required.

Tape Streamers

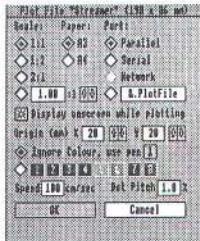
60Mb without SCSI card (TS60SCA)	£999.95
60 Mb with SCSI card (TS60SC)	£1099.95
150Mb without SCSI card (TS150SCA)	£1254.00
150Mb with SCSI card (TS150SC)	£1354.00
P&P on Tape Streamers	£15.00
60Mb Tape Cartridge	£24.95
150Mb Tape Cartridge	£27.95
P&P on Tape Cartridges	£0.75

SCSI Tape Streamer

Plotter Driver

This Risc OS utility allows users of iDraw (and other software that produces drawfiles) to output drawings to HPGL compatible plotters.

By simply dragging a drawfile onto the Worrall Plotter icon on the icon bar, it will be output as HPGL commands to the selected destination.



Pen speed, plotter size and pen configuration may be selected from within Worrall Plotter. Outputs can be scaled and offset and then sent to either of the ports, the network or to file. Output may be mimicked on screen at the plot proceeds.



Worrall Plotter will render all CAD type objects and will render text objects in the plotter's own font. Sprites, line thickness, fills and text column objects are ignored.

Worrall Plotter costs only

£29.95 P&P £4.50

Worrall Plotter



Oak Computers
Cross Park House
Low Green
Rawdon
Leeds
LS19 6HA
Tel: 0532 502615
Fax: 0532 506868

Government
Orders
Accepted
All prices exclude
VAT.

Hints & Tips

- **!chars** – which is available as **!stchars** with FWPlus version 2 and is also available on SID + Archive BBS + various PD discs, can be used for “mousing” text into **!Draw** applications.
 - **!Draw** – You can use the cursor keys for fine positioning when drawing Bezier curves or lines.
 - **!Madness** – I was always very disappointed with this Demo – until I looked at the **!RunImage** file and found a variable called **madspeed%** – guess what changing it to 1 does? Rob Davison
 - **!system on floppies** – Those of you without hard discs will have **!system** on various of your floppies. The trouble is that when you change to other discs, even if they have **!system** on them, you will be asked to insert the disc containing **!system** that the computer saw first of all. To get round this, double click on **!system** on the current disc before trying to launch applications from the disc.

- **Art Nouveau**—Fills approximating to graduated, logarithmic, circular etc can easily be ‘designed’ and saved to disc. For example:
Approx circle fill – Set a small grid size and switch it on. Draw several concentric filled circles, selecting each shade as you go. Smear the edges with ‘colour merge’ if you don’t want the bands of colour to show. Pick it up as a brush and use with: brush, effects1, distort x (or y). Some of the effect that Pro-Artisan and Atelier have as features can be cobbled together with a little effort using Art Nouveau (at half the price!). D P Allen.

- Beware the SUM! – If you rely on indentation in your programs to keep a check on the structure of the various loops, beware that `SUM(A())` will cause an extra indent. Is there any way round this? Fred Hartley, Hayes.

- **Booting** – When booting the Archimedes up it is tempting to just refer to applications assuming their path starts at the root (\$). e.g. !Edit – can be installed on the desktop using just !Edit in a boot file.

However, this will not ensure the appropriate system variable is set up with the full pathname. Again using !Edit as example, you would get just –
Edit\$Dir = !Edit

To avoid this put the full name in the desktop boot file, e.g.

*Run adfs:HardDisc.\$.!Edit

Only of much use if, like me, you decide to set the directory yourself while using Desktop (despite what Acorn advise!). Ian Pollock

- **Graph-Box** – superb program but I find it very annoying that it ‘dies’ when you close the window. The following changes will give Graphbox an icon on the iconbar. It will only ‘die’ when you click <menu> followed by ‘quit’ as Edit and Draw etc. This lets you clear some valuable desktop space to write a letter or whatever. while still having Graphbox available on the icon bar.

*BASIC

```

LOAD "!GraphBox.!RunImage"
220 WHEN 3:PROCclosew(!q%):IF!q%=
    w_graphbox% THEN mainclosed%=true
560 quit%=false:mainclosed%=false
4590 WHEN0:PROCclosew(w_graphbox%)
                           :quit%=true

5291 Icon%=sprites%:Icon%=true:
    DIM Spritename% 14:$Spritename%=
        "!graphbox":Icon%!4=0:Icon%!8=0:
        Icon%!12=64:Icon%!16=68:Icon%!20=
            (&311A OR (7<<28))
5292 Icon%!24=Spritename%:Icon%!28=1:
    Icon%!32=12:SYS "Wimp_CreateIcon"
                   ,Icon% TO graph_iconbar%
5445 READ t$:m_iconbar%=$Ncrmenu(t$)
5447 DATA "#Graphbox,Info>w_pinfo",
                           Quit"

5710 REM quit%=true
6395 IF mh%=-2 AND mb%>4 OR mb%>1024
    AND mi%>graph_icnbar% THEN PROCgetw
        (w_graphbox%):PROCfront(w_graphbox%
            ,420,150):mainclosed%=false
7375 WHEN-2:IF mi%>graph_icnbar% THEN
            PROCpop(m_iconbar%, -1)
8219 IF menu%>m_iconbar% my%+=64
8545 WHEN m_iconbar%:IF !mlist%!=1
            THEN quit%=true
16505 IF mainclosed%>true PROCfront
        (w_graphbox%, 420, 150):
            mainclosed%=false

SAVE "!GraphBox.!RunImage"

```

NOTE: Graphbox claims what you have in your next slot up to a max of 640k but as the program needs only a minimum of around 200k to run, there's space for a very big graph! Before loading Graphbox, drag the 'next' slot down to about 330k to free some more space. You can edit the !run file and change the -max to reconfigure it more permanently. Rob Davison

- **Installing Alerion** – Here are the steps you must take in order to install RISC-OS Alerion onto your hard disc:

- (i) create a RAM disc with at least 432k
- (ii) copy the !Alerion directory into the RAM disc
- (iii) alter the RAM disc !Boot file in the !Alerion directory so that it reads:

```
IconSprites <Obey$Dir>.!Sprites
```

- (iv) also alter the !Run file so that reads:

```
Set Alerion$Dir <Obey$Dir>
RMClear
RMLoad MemAlloc
RMSize 320k
ScreenSize 160k
RMKill MemAlloc
Run <Alerion$Dir>.!RunImage
```

- (v) copy the !Alerion directory from the RAM disc to your hard disc.

- **Rounding Errors** – Try typing P.STR\$(0.6) in BASIC. If you are putting the string of a variable into a writeable menu option when programming a wimp system and this rounding error comes up, the resulting string can overwrite some of the data structure for your menu. The result is often an "Abort on data transfer"! This can be quite hard to track down so be careful. DIMming the block to 5 bytes will stop a crash but will leave the user with a 0.6666666669 to edit instead of 0.6. This can be a bit disconcerting. To solve it, set @% to round to e.g. 2 decimal places before doing the STR\$ and reset @% afterwards – see 400 series BASIC Guide pp277-278 for details. Rob Davison

- **Screen modes & memory claiming** – If your program has a proper RISC-OS front end, it can change modes without worrying about screen memory. If there is enough in 'free' and 'next' it

will be shunted to screen memory and the mode selected. Rob Davison

- **Synthesiser MIDI modes** – The answer to Gerald Fitton's problem (issue 2.12 p 18) that his Korg synthesiser plays all channels no matter what he does, is that his synthesiser is not in the correct MIDI mode.

All MIDI devices operate under modes. These are as below:

MIDI mode 1:	OMNI On/Poly
MIDI mode 2:	OMNI On/Mono
MIDI mode 3:	OMNI Off/Poly
MIDI mode 4:	OMNI Off/Mono

OMNI On/Off selects whether the device receives on all MIDI channels (OMNI On) or only on one MIDI channel (OMNI Off). Poly means that the device will be able to play two or more notes at the same time and Mono means that it will only be able to play one at a time. The Korg will almost certainly be in MIDI mode 1, which is how most synthesisers are set up when they are sent from the shop. The answer is to change the MIDI mode to 3 or 4 and to set the Korg to receive on the same MIDI channel as Maestro is sending.

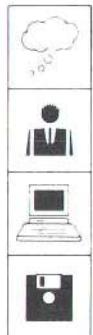
- **Wimp Resizing** – I have written a program which needs a large area of memory as store for data. The program works in the desktop and claims memory via SYS "Wimp_SlotSize". Initially, I used the BASIC statement "END=HIMEM + value%" but this also changes the address of HIMEM. Loops, procedures and local variables are stored just below HIMEM so my data was being overwritten. I tried lowering HIMEM immediately afterwards but things still went wrong so I use "Wimp_SlotSize" directly. BASIC is ignorant of the new memory area and it can therefore be safely used as a store. Use a variable "Claimer%" and exit the Wimp_Poll loop if it's not zero then call Wimp_SlotSize. R.D.

- **Window resizing bugs/errors** – The bug in Interactive help Archive 2.11 page 8 is not a bug but a result of !Help setting a window work area extent in less than a multiple of four. The program is in C so I can't edit it. I discovered this when writing my own software. When a window was stretched to its full extent it would not grow smaller in the y direction until you moved in to the left. R.D. A

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Hardware Column

Brian Cowan

Expansion Bonanza

Some months ago, I learned that there was a "significant project" under development at Intelligent Interfaces Ltd. Those of you familiar with products from this company will know that I-I Ltd is the birth place of the Archimedes IEEE 488 interface, as well as the twin RS423 serial board and the sixteen bit digital I/O podule.

I think the byword at Intelligent Interfaces must be *reliability*. I have never heard of a product of theirs breaking down. However, a clearly related fact is that their prices are quite high, often beyond the pocket of the amateur. This may well be so for the product I want to discuss this month. If so, I apologise in advance and beg you simply to regard the following as a description of what other people might want to do with their Archimedes.

What do we need?

Putting two and two together and making something approximating to five, I realised this was a hardware project which would permit the use of an existing family of interfacing cards. In that, I was correct. In comparing the life of an Archimedes user with that of an IBM PC (clone) owner, one most frequently hears about software availability. There is so much software available for the PC that you are almost bound to find a package to suit your requirements, even if it is a pretty feeble implementation, running at a snail's pace and trying to make the best of the prehistoric hardware. However, there is another factor contributing to PC "smugness" – the range of hardware expansion cards available for the machines. There is a board for almost every requirement and often they are quite reasonably priced. I guessed (wrongly!) that the Intelligent Interfaces project involved the connection of PC expansion boards to the Archimedes.

STE bus cards

It was not to be connection to PC cards, but a link from the Archimedes to what is known as the STE bus. I will explain in due course what this bus is, but the important fact about this bus is that there is an enormous choice of not only I/O interfacing cards,

but also intelligent boards, CPU/microcomputer cards using Z80, 6800, 8080 and 80286. There are also memory cards, disk interfaces and SCSI drivers. There is even an EPROM programmer.

The STE to Archimedes Link

The product from Intelligent Interfaces comprises a single width podule for mounting in the Archimedes, and a card which is fixed in the STE rack. These come with an interconnecting ribbon cable and software for the Archimedes to communicate with the STE system. This will set you back around £500 (final price not yet fixed), but remember that this is before you have bought either an STE rack or any STE cards. I also understand that later on there will be some support software in the form of relocatable modules produced to drive some of the more popular STE cards. This is implemented essentially as an extension to the Archimedes interrupt handling system.

The STE bus

So let's now get down to what the STE bus is all about. It arose as a standard backplane bus for interconnecting microprocessor sub-systems. The important point was that it should be processor-independent; not biassed towards any one particular family of products. The STE bus standard has now been formalised as IEEE 1000 and a published document specifies its characteristics. The scheme was designed as a low cost 8-bit (data) bus based on single sized Eurocards and the DIN 41612 connector (like the Archimedes podules). There are 64 connections since the centre row of pins is unused. The standard specifies the function of each pin.

Bus specification

There is a 20 bit address bus for memory, permitting direct access to one megabyte. Input/output is not memory-mapped, it has its own space addressed by twelve bits, providing 4k locations. Data transfer is asynchronous, permitting peripherals working at different speeds. Thus in any transaction, the speed of transfer is governed by the slowest participating unit. There is the facility for direct memory access (DMA), and four of the total of eight attention request lines are usually reserved for that purpose.

Masters and slaves

Cards in the system are broadly classified as masters and slaves. A master is an intelligent card and it is able to control transfer of data on the bus. A slave interacts with the bus under the direction of a master. It is possible for a slave to be intelligent, having its own CPU, but that only helps implement the slave's function; communication with the bus can only be effected by a master.

The STE bus permits more than one master on the bus. Clearly some means of arbitration is required and the function of arbiter is usually incorporated in one of the master boards. The Archimedes plus STE link appears as a master in the STE rack and the Intelligent Interfaces card includes an arbiter. Thus, at any stage, the Archimedes remains completely in control and it never has to wait its turn.

The backplane

STE cards are attached to a backplane whose features are specified by the IEEE 1000 standard. Firms such as Vero provide backplanes comprising between three and twenty one "slots". The backplane is usually fixed in a 3U size Eurocard rack together with a power supply module. Boards can then be slid in and out as required.

8 Bit data bus

One limitation of the STE bus is the eight bit wide data path. It may seem silly to drop down to eight

bits when the Archimedes is happy working with 32 bit words. However, there two points should be considered.

Firstly (for reasons I don't understand) the podule data bus is already cut to sixteen bits, so a further halving is not the end of the world; it involves only one unavoidable halving. Combining sixteen bit half-words or even bytes is performed extremely efficiently by the ARM's barrel shifter.

The second point is that if speed of data transfer is so vital then you should use a dedicated Archimedes podule anyway, although the STE bus will support transfer rates of over 5 Mbytes per second. There is the VME bus standard which supports a 32 bit bus but that is a far more expensive system. I think Intelligent Interfaces got the balance right in going for the STE bus.

Spoilt for Choice

The current STE bus Product Guide lists over 500 different cards. These include CPU boards, digital signal processors, many digital and analogue I/O boards, stepper motor drivers, to name but a few. With the relocatable module support software, this will be an extremely versatile but straightforward way of expanding the Archimedes and of using it in complex experimental and process control situations. The next step will be for someone to produce an "Archimedes" on an STE card! **A**

Comment Column

- **Acorn User Show** – Book the date in your diary – September 7, 8 and 9 at Westminster Exhibition Centre (known and loved by many as the Royal Horticultural Hall – a rose by any other name...?). We hope to be there on our usual stand (number 126) in the right hand corner just by the fire exit(!) so we hope to see lots of you there!

- **Archimedes in business?** – When are Acorn going to get their act together and allow us to have decent networking facilities, at decent speeds? Do they really consider the Archimedes to be a decent business machine when you are unable to get it to network at suitable transfer rates?

By the way, would any of you like to have a business section in the magazine? If so then I would be happy

to help put the section together if there is a reasonable amount of interest! Graham Hobson

- **ARM3** – My Dealer and I were the first ones in New Zealand to receive an ARM3 upgrade. (The boxes came labelled 50 & 51 !!) Many of my animations are a disappointment as they use WAIT statements within the main loop – these show little or no change. Acorn's molecule demo lets you see both effects – no speed increase until you go to Speed 0 then you see about 2 frames out of the fifty!

Video Bandwidth – I ran the excellent tests written by Richard Averill in Archive 2.11 with great interest. The results show that the only thing slowing an ARM3 Archimedes down in the higher modes is the much larger amounts of screen data to

be manipulated – video bandwidth takes nothing away! For example, the time for VGA mode 28 is eleven times as fast with the ARM3 on! (Mode 21 is 9 times as fast).

I tried ray-tracing the 'Balls' scene supplied with Render Bender in mode 21. It took only 10 minutes with Shadows off and Cache ON. Remember this is tracing 327680 pixels! I don't know the time for cache off and don't have the time to wait!

Hard Disc speeds – The ARM3 helps a great deal when it comes to loading speeds as the table below shows. It shows the speed in kbytes/sec for loading a 300kbyte file from my E format 40M ST506 into a block of main memory.

Mode	ARM3 OFF	ARM3 ON
0	406	396
15	406	406
21	80	400
28	16	226 = 13 fold speed increase!

R140 speed with ARM3 – I think Archimedes machines with MEMC1a can be called 5 MIPS machines – remember the figure for the original Archimedes 300's was 4.77 million VAX type instructions per second. The MEMC1a gives an average increase of between 10 and 20%. An ARM3 equipped R140 should be good for 15 MIPS. The complaints in A&B about the speed of the R140 mentioned the large (32k) page size of the ARM as a limiting factor when slaving small tasks to/from hard disc. This would be improved to a very great extent with an ARM3 as the drive speed could be kept up due to the reduction (elimination?) of video bandwidth problems. Unix is always run in VGA modes 27 & 28 or the high-res mode 23. Also, a large capacity SCSI would increase things further. Rob Davison, New Zealand

• **Bulletin Boards abound!** – It's all systems change at the moment, in the Archimedes bulletin board world. The bad news is London Archive BBS is closing as from March 9th. Grateful thanks for Alan Glover and Karen Dunkley for the tremendous work they have done in running that board for us. Alan in particular has been working on the board for well over a year. They have maintained a very high standard and we are most grateful to them for that – I know from being involved in running (or trying to

run) the original Eureka BBS here in Norwich, just what a nightmare that can be.

Alan and Karen are (together) moving to Cambridge soon. We wish them well in their new jobs and, in due course, their marriage!

Out of the ashes... The good news is that two new Archimedes boards, Archive BBS in Norwich and Arcade in London will be starting up around the same time. The registered users will automatically be transferred across to both boards and both will be using the same software, courtesy of our World of Cryton expert, Hugo Fiennes. I will put the new phone numbers on the back of the price list if I get them in time.

• **Cambridge Pascal versus Acorn Pascal** – I just saw David Wild's comments on Pascal in Archive 3.5 p 36, and I must say that I couldn't agree with him more! I think that some of his comments were too fair with Dabs Press. It looks to me as if the Pascal is a revision of their BASIC compiler, adjusted for the different syntax.

It has a serious mistake in its handling of certain type declarations, indicating a bad treatment of Pascal's scope rules.

The 'string' facility is not such a great benefit as it would seem – it is not such a bad thing for the compiler to know about all the data/variables to be used by a program before it starts and, having converted a 300k source from a Pascal with 'strings' to ISO Pascal, I can say that as long as suitable Abstract Data Types are set-up, and access procedures provided (which, on the Acorn version may be done from a separately-compiled module) the final program need look no different at all from a program on a Pascal which does support strings. However, such things are very non-standard and the inability to switch off the Cambridge Pascal extensions is regrettable.

Contrary to what Dabs Press say, the lack of Conformant array parameters is a serious mistake, as they make certain program types far easier to implement. Any good Pascal compiler should allow them to be disabled, if necessary (Acorn's does).

Lastly, not many people ever mention Acorn's superb debugging facilities. When a run-time error occurs, the current values of the variables are [Space] or [Return] to continue, [N]onstop, [Ctrl-C]

aborts displayed, together with their values. The compiler then 'goes up' to the procedure which called that code and does the same there – and so on, up to the top level. At each stage, the line number of the procedure call and the line number of the start of that block are also displayed. This must be one of the best run-time environments I have ever seen for Pascal – and it is also pretty fast.

In my opinion, anyone wanting Pascal should get the Acorn version. The lack of desktop 'integration' is more than made up for by the extremely comprehensive run-time symbolic debugging facilities. I would also strongly recommend them to get 'Condensed Pascal' or 'Oh! Pascal', by Doug Cooper as an easy to read introductory text.

Finally, there are a few problems with Acorn's Pascal and they may be upgrading it to release 3 sometime later this year. However, the fact that I managed to do such a major port as the Imperial College Hope Interpreter (*Available on Shareware 18. Ed.*) is quite a credit to the package. Michael Ben-Gershon.

- **Charity money** – To date, we have raised almost £10,000 for charity through Careware and other charity donations that people have made through Archive. Would anyone object if I sent some of the money to Anglia TV's Telethon Appeal? That way it gets spread around to a few more charitable causes. I am a bit conscious that we are, at the moment, giving a lot of money to a small number of charities (Children in Need, Norwich Toy Library and T.E.A.R. Fund for its relief work around the world).

- **Eproms, A310's and RISC-OS 3 upgrade** – Before all of the existing A310 owners decide to sell their A310's and upgrade to A410's, please consider the following. I think that all is not lost when it comes to using bigger Eproms of 2 megabit capacity (2 megabit/rom * 4 roms / 8 bits per byte = 1Mbyte). The current socket for the PROMs (1megabit) has 32 pins. Whilst I have not seen the pin connections for the 2 Mbit devices Acorn intend using, I think that they will indeed fit into the new sockets. The problem arises because the extra address line required to access the new device is not wired into the A310 address circuitry. Indeed it is tied to the +5volt line. However it should be a relatively straightforward task for a competent

technician to modify the main PCB to connect address line A17 on each of the PROMs to A19 (pin17) on IC28 (74HC573).

As an aside, perhaps Acorn could arrange the new ROMs in two halves. If the new operating system was put into the lower half of the roms and the applications into the upper half of the roms, owners of unmodified A310's could at least have access to the new operating system. Applications could then be loaded from disc in the usual way (not a problem with a hard disc and lots of ram). Just a thought.

Ralph Barrett

- **Friendly rivalry but no hostility** – Sheridan Williams of Beebug Ltd wrote us a very friendly letter about the misunderstanding over the cancellation of our advertising series in Risc User. Apparently, they have had a number of letters from Risc User readers taking them to task for their attitude towards Archive. Please don't send them any more letters – the mistake was partly mine anyway.

In fact, the reason they cancelled our adverts was that the data on our Shareware N°7 did not conform to their Arcscan II format. So, as soon as we correct the data format, they will be happy to accept further advertising from us.

As Sheridan says, "No-one at Beebug has any animosity towards Archive – a friendly rivalry – yes, hostility – no."

I'm glad we have got it sorted out now. I have always felt that there is plenty of room for both Risc User and Archive. I feel that they complement each other very well. Ed.

- **Genesis review** – "Could I comment on the 'Genesis' program which I have recently had a look at. It is described as a 'database' in the February issue but Doug Weller's review in the January issue makes clear that it is essentially a data presentation system of a rather different type.

Clearly, as Doug says, it will be useful in schools both to present programmed teaching material and as a pupil resource for the presentation of research. However, will it not also have applications in commercial practice? The program would lend itself to, say, a garden centre presenting designs for gardens, details of suitable plants, cultural details, etc. The program allows the user to go easily from

one page to another according to interest and is both easy to compile and browse through – well I can do it!" Chris Beck

• **Monthly program discs** – It has been pointed out that we don't really advertise these or explain what they are. Well, for a nominal £3 a month you get the listings that are printed in the magazine and any other data that authors of the articles provide. Then we put on a few extras to fill up the space and sometimes the core content of one or more of the previous months' program discs. We don't pretend that these are of the calibre of the monthly program discs produced by other magazines – instead, we keep the good PD programs that people send to us for use on the Shareware and Careware discs.

If you want to have the monthly disc sent to you automatically each month, you can pre-pay for as many or as few discs as you like. However, there is no discount for quantity – well, what do you expect at £3 a disc, which is the same as it was two and a half years ago when Archive first started! Also, it is

not a subscription in the sense that when you run out of pre-paid discs, we do not write to tell you. It is up to you to keep track of what you have ordered.

Because we do not know what Shareware and/or Careware discs we will be producing in the future, we would ask you not to pre-pay for those. If you send a pre-payment all we will do is to send you a credit note which you have to return in order to use it against future purchases from Archive. Sorry, but with limited staff (a deliberate policy to keep us "small and friendly") there is a limit to the number of facilities we can offer. Ed.

• **Wot no UNIX?** – Why doesn't Archive have a UNIX column? I feel that UNIX is important for the future development of the Acorn Archimedes and so a bit of information about the UNIX environment would be very interesting. M Ferrow.

I'm quite happy to have a Unix Column if someone will write it for us and if you, the users, will make your contributions by feeding information to the Unix Editor. Ed. A

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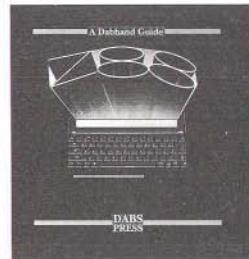
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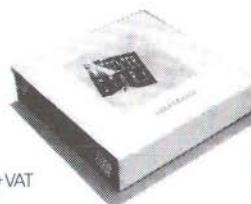
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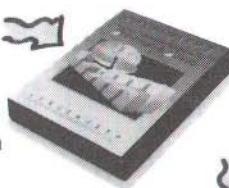
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Archimedes First Steps

Peter Jennings

When you unpack an Archimedes and see how much documentation comes with it, you may feel that another book on using it would be rather superfluous. There is the slim Welcome Guide and two fatter volumes, the User Guide and BBC BASIC Guide. However, when you examine these three books you find the Welcome Guide does little more than help you plug together the various pieces of hardware and explain how to use the desktop. This is probably enough for anyone intending to use only commercial software and do no programming themselves. The BASIC Guide has a useful chapter on the differences in the various versions so it is not too difficult to learn the extra keywords in BASIC V if you are already familiar with BBC BASIC.

The User Guide is less digestible. At first sight, it appears to contain everything you could possibly need to know. That is, until you begin to wonder how Acorn have managed to fill another four, expensive volumes of information for the Programmer's Reference Manual.

The problem is finding the information you need. It took me weeks to discover the use of *SET Alias\$. I assumed at first it must be something to do with fonts, having come across anti-aliasing, until I spotted a tip in Archive which suddenly made it clear and, with a bit of delving in the User Guide, I found what a valuable command it can be.

First Steps

I waited with interest for the publication by Dabs Press of Archimedes First Steps, described as a beginner's guide to the Archimedes written by the author of Acorn's RISC-OS Welcome Guide.

The book is a paperback, uniform in style with other Dabhand guides. The pages are split up with bold subheadings and illustrations which give the book an attractive, readable look. The appearance invites you to read it through, rather than just dip in to sections that you think may interest you. This is the best approach if you are to understand everything mentioned in later chapters.

It turns out to be very readable with clear, simple explanations, assuming little or no previous

knowledge of the Archimedes and taking the reader step by step through the use of the computer and the software that comes with it. As well as the detailed explanations of technical terms, there are brief reminders of the meanings when they are referred to again later in the chapter.

Contents

The book begins with an explanation of the term WIMP, which is printed down the page as the initial letters of Windows, Icons, Menus and Pointer. Unfortunately, there is then the first of a sprinkling of silly mistakes and confusing contradictions which occur throughout the book. Two pages later the mouse is introduced as the M in WIMP and later on the M is again said to represent 'Menus'. The rest of the chapter has a clear explanation of how to use the desktop and ends, as all the chapters do, with a brief summary of what it has covered.

The next three chapters cover discs and filing systems and I have a few quibbles here. For example, when copying between directories by highlighting a number of files with <adjust>, it is not then necessary to use <select> to move them, as the book instructs. As soon as the last file to be copied has been highlighted, it can be dragged to the new directory with <adjust> still pressed. The other highlighted files will follow.

Filing systems are explained by the familiar comparison with filing cabinet drawers, folders and files but the diagram of a directories structure does not label the root directory as \$.

The next few chapters will probably be the most pored-over section of the book. They give good tuition in using the four main programs on the two Applications Discs: Edit, Paint, Draw and Maestro. Anyone who has struggled through the chapters in the User Guide and found them hard to absorb, will welcome the simple step-by-step approach which is a feature of the Dabhand book.

The illustrations are particularly helpful in the chapters on Paint and Draw where there are, for instance, series of drawings showing the effects of manipulating sprites. There is even a pair of rectangles to make clear the difference between

portrait and landscape shapes, which must seem odd jargon to anyone not familiar with them as photographic terms.

These are followed by a chapter on fonts and a detailed explanation of how to customise the computer to your own needs and preferences. This could prove the most exciting discovery for a newcomer to the machine.

A brief chapter on the Ram Filing System (Ram Disc) covers its value as a means of copying with only a single disc drive.

A section on RISC-OS, lists and explains some of the more commonly used commands. These include *SET Copy\$Options but does not say what the *Copy defaults are. Only seven of the options are given and explained (omitting the very useful Q) although nine (including Q) are included in an example boot file on the following page. Also, although it correctly shows the command *SET Alias\$<new name> <old name>, it then gives the example *SET Alias\$Verify Check with the parameters in the wrong order.

A chapter on BASIC IV and BASIC V explains how to leave the desktop to use BASIC and lists the additional commands introduced on the Archimedes, although it does not explain them but refers to the Acorn Guide.

There are four pages on modules, dealing with the three in the Modules directory on Applications Disc 2: 65Tube, BASICEditor and Hardcopy and a chapter each on the 6502 and PC emulators – followed by one on setting up printers and using printer drivers.

Sting in the tail

After that the book rather tails off. There are sketchy outlines of 15 software products of various types and a more useful look at some of the available hardware additions. I would like to have seen something here on using a ROM/RAM board with battery back-up as a non-volatile Ram Filing System, compared with a RAM disc which loses its contents when the micro is switched off.

The final chapter, A Finger on the Pulse, mentions magazines (including Archive), Acorn's Support Information Database (SID) and one exhibition, the BBC Acorn User Show "held annually in July or

October" – encouraging news, if the show has been confirmed as an annual event. (*See page 11. Ed.*)

After that come three appendices. One is on sources of free or low-cost software, including shareware, public domain and bulletin boards and another is the inevitable chapter advertising Dabhand products which appears in all their books that I have seen.

The third section, on Understanding Printer Codes, is more confusing than useful. ESC E is correctly given as the code for emphasised type, then referred to as the code for italic. This is followed by details on how to turn off emphasised type which gives the code for this as ESC 5, the code for turning off italic. Fortunately these escape codes are not normally used on the Archimedes and the correct VDU codes are given. There is a short basic program to illustrate printing in normal then emphasised type:

```
1 VDU 2 : REM turns printer on  
2 PRINT "This is normal text"  
3 VDU 1,27,1,69  
4 PRINT "This is bold text"  
5 VDU 3 : REM turn printer off
```

This is all OK, but it is then suggested that two more lines are added to cancel emphasised type:

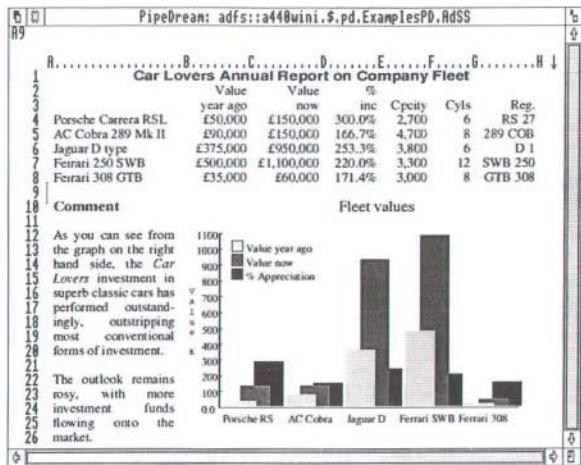
```
10 VDU 1,27,1,7  
11 PRINT "Normal text once more"
```

Line 10 should end with a 70 instead of a 7 (the correct code is printed in the preceding paragraph) but with the printer turned off at line 5 these additional lines will do nothing any way.

It is a pity that the book is marred by these careless errors, which give the impression it has been hurried to press without being properly checked. I hope it will go to a second, revised edition because it is the ideal book, in style and content, for anyone new to the Archimedes or even more-experienced users who feel they are not getting everything they could from this marvellous machine.

Leaving aside the Acorn manuals, there is no other introductory book relating to the Archimedes and, despite the errors, which are mostly trivial, I would still buy it at £9.95. After paying a thousand pounds or more for an Archimedes and its peripherals, it would be senseless 'economy' not to spend another tenner to get such clear instructions on how to get full use of them. **A**

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All trademarks acknowledged. The chart in the screen shown above was produced by sending numbers from PipeDream 3 to Lingenuity's Presenter 2 and then loading the resulting graph back into PipeDream 3.

Colton Software, Broadway House, 149-151 St. Neots Road, Hardwick, Cambridge, CB3 7QJ, England.

Fax: 0954 211607 Tel: 0954 211472

PipeLine

Gerald Fitton

Many thanks to all of you who have sent in letters to PipeLine. This is definitely not a Nothing In Nothing Out column. If anything, the problem is selecting what to include and what to leave out. However, don't let that deter you in any way, all letters are read carefully and individual answers are sent where possible so please keep them coming. Please write to me at Abacus Training or through the Archive office. Please be patient waiting for a reply – this month I have a table full of PipeLine mail. If your contribution is an example (such as a printer driver or spreadsheet) it would help if you could include a disc copy for the benefit of others. It also saves me typing from your script and reduces the risk of me introducing errors in the 'translation'.

More printer drivers

Included on the Archive Monthly Disc are PipeDream printer drivers for: NEC P2200, Citizen 120D, Shinwa CP80 and the Panasonic KX P1124. There is also a driver for the HP DeskJet which produces 20 cpi horizontally and 15 lines per inch vertically: it is great for wide spreadsheets and layouts which require long lines of script. This HP DeskJet driver also runs on my Epson GQ-3500 using the HP LaserJet emulator, presumably, it will run on a proper HP LaserJet.

I am hoping to get a disc copy of a driver (currently only in manuscript form) for the Panasonic KP 1081 and HP DeskJet which will produce the IBM character set.

I have been asked for a PipeDream printer driver for the Star LC24-10. Has anybody got one?

The bottle of champagne

At the time of writing I have not heard from Colton that anyone has won this yet. Let me remind you that it is for a method (which cannot be classed as 'cheating') of right-justifying to two different widths from the same left margin position in such a way that a draw file can be included as a graphics picture to the right of some text. Colton are the sole arbiters of what is 'cheating'. If you believe you can solve this problem then please write direct to Colton (not to me nor to Archive) with a solution preferably

on a disc as well as typescript. The first solution which is not classed as 'cheating' wins the champagne.

RISC-OS printing with a 1M machine

John Greening has had success with the following method:

Use the task manager to set SpriteSize 0 and font cache to 48k. Click <menu> on the palette icon and then click on mode 12. This reduces the screen memory from 160k to 80k. For most of your work stay in mode 12 but just before printing out switch to mode 0 (or mode 1 if you have sprites to print). Double click on the !PrinterDM to get the icon on the icon bar but then click over the icon with <menu> and choose quit. You still have the printer driver installed but you save about 72Kb.

With this technique, before loading a document John has 192Kb free for applications and 17Kb free in the RMA. The following modules can be unplugged: BBC-Econet, NetFiler, NetStatus, Podule, Percussion, Stringlib, Wavesynth, Soundchannels and SoundDMA to save more space if you need it. John uses a couple of BASIC programs which configure before and then reconfigure after using PipeDream. I do not have a copy of John's BASIC programs so they are not on the monthly disc. I am hoping to get more information from Colton about this for next month.

Printing

For this month's featured subject I shall try to describe the relationship between what you type at the keyboard, what you see on the screen and what gets printed on the printer. Before doing so, I think I should say to those who used to use such machines as the old BBC B with, for example, Interword that the PipeDream program (like many applications on many machines such as those of the MS-DOS range) does not contain its own character set nor its own printer driver. PipeDream lets you, the user, install any character set and any printer driver you want.

To many people, this division of responsibility for the use of the application presents a problem that they did not have on their old machine with their old software. In particular it is usually a mistake to

blame PipeDream if your Printer Driver doesn't print out what you see on the screen. I hope this month's PipeLine will help you to understand how you can benefit from the flexibility that this approach gives you when you come to upgrade your software such as when you include user defined system fonts, buy extra outline fonts or get a laser or DeskJet to replace your 9 pin or daisy wheel printer.

Character sets

First a bit of background... Characters are represented by 8-bit bytes. These bits are rather like eight switches that can be on or off giving 256 different combinations which can be written as 00000000 to 11111111 in binary, or &00 to &FF in hexadecimal or 0 to 255 in the more familiar decimal notation. Every character in a character set is given a unique code number between 0 and 255. There are 26 letters in the English alphabet, 52 if you count upper and lower case letters separately, ten digits from 0 to 9 and a whole set of punctuation marks as well as the space, giving you 95 printable characters all together which are coded from 32 to 126 and can be entered directly from the keyboard. Code numbers from 0 to 31 inclusive are reserved for special screen or printer effects such as moving the cursor left (code 8) or right (code 9). Code 10 moves the cursor down a line or causes a line feed at the printer. Code 13 causes the cursor to move to the left of the current line. Pressing <return> causes both a code 13 and a code 10 to be sent to the screen drivers so that the next character to be printed appears at the left end of a new line. Code 127 is the <delete> key.

In addition to these there are another 128 characters with code numbers from 128 to 255. These are called 'top bit set' characters (because the first binary bit of the 8 bits is set to a '1'). The character produced by any of these top bit set characters depends on the character set in use at the time. The default character set is Latin 1 but there are others such as Bfont and Greek of which more later. These top bit set characters can be entered from the keyboard by holding down the <alt> key and typing in the code number on the numeric pad or by using the !Chars application provided by Colton. For example, in Latin 1, you can get the character μ by holding down <alt> and typing in the number 181

on the numeric pad. When you release the <alt> key the character μ appears on screen.

As an alternative, you can double click on the !Chars application. When you do this the current character set is displayed in the system font in a window called Characters; you can change this character set with a command such as *Alphabet Greek (press <f12> to initiate a * command). If you change the character set in this way, any top bit set characters will be displayed in the new character set in the PipeDream window as long as you are using the system font. When you click on any character in the Characters window, that character code will be entered into the PipeDream window at the current position of the cursor and the same character will be displayed in PipeDream as in the Characters window so long as you are using the system font.

Fonts

If you choose to display in some other font such as the outline font Trinity.Medium then the character codes are translated into pictures on the screen according to the way in which the font is defined. All Acorn fonts (except Selwin) use the Latin 1 character set so, whatever *Alphabet you have used (e.g. *Alphabet Greek), the display will be in the Latin 1 character set. What I want to buy, and can't find one anywhere, is an outline font set similar to Trinity or Homerton but which uses the Greek character set. Can anybody help?

Using printer drivers

What happens when you print from PipeDream depends on whether you are using a PipeDream printer driver or a RISC-OS printer driver.

PipeDream printer driver

The printer driver is installed using <ctrl>+PD or from the Print menu. Select as the type of printer, Parallel (or Serial) but not the RISC-OS driver. In the next row type in the name of the file containing the PipeDream printer driver; we have quite a few donated by PipeLine readers. Press <return> and this printer driver will be loaded.

When you use a PipeDream printer driver and send a file to the printer, it is the code numbers (such as 65 for an 'A') which are sent to the printer; how they are printed depends on the character set which is resident within the printer. Many printers have the

same English characters for character codes 32 to 126 but they do not use the Latin 1 character set for the top bit set characters. Some printers support the IBM character set which has some graphics characters.

Epson FX printers

On the Epson FX80 and many other matrix printers it is possible to redefine the matrix of dots which are printed when a top bit set character code is sent to the printer. In the 'printer' directory of this month's Archive disc, I have included a set of character definitions for an FX80 which print out the same characters as the *Alphabet Greek character set. The character definitions are in the form of a BASIC program and all you need to do to download the definitions to the printer is to click on the BASIC program 'Greek' so that it runs once. The BASIC program also executes the command *Alphabet Greek so that the Characters window called up by !Chars will display the Greek characters which will then be printed out by the Epson FX80.

One word of warning. Many printer drivers for the Epson FX80 (including that supplied by Colton) have a Printer ON string (PON) which resets the printer and so clears all the definitions you have downloaded. I have included a new FX80 driver on the monthly disc called FX80Pica which avoids this potential problem. Use it in conjunction with the Greek program if you want to print out Greek characters on an FX80.

Epson 24 pin printers

For those of you with an Epson 24-pin printer I suggest that you contact Mark Barr, 12 Pembury Avenue, Worcester Park, Surrey, KT4 8BT (01-330-7671) for a range of printer fonts that can be downloaded in a similar manner. Mark also has a program which allows you to define your own downloadable 24 pin printer fonts.

NEC printers

For those of you with the 24-pin NEC P2200 wanting greek characters, Michael Ben-Gershon through Leonard Melcer has provided something similar. His BASIC program, etc are also on this month's disc in the Melcer directory. He also describes how to redefine the characters shown on the screen (i.e. the ones in the system font) making

use of the command *Copy CharDefs rawvdu: ~C~V to transfer the character definitions to the screen drivers. The new screen definitions shown in the Characters window (invoked with the application !Chars) match the printer definitions sent to the printer by the BASIC program. You should use Leonard's NEC printer driver to avoid wiping out the newly installed printer definitions. More of this technique in a later PipeLine article.

More highlight codes

Many of you have asked how to increase the number of printer highlight codes to enable you to use, say, expanded printing or double height characters (supported by the Star LC24-10). Typically I have a letter from D Hunt who has tried to do this by defining a set of SPD(n) (SPD for Star Printer Driver Commands "From Appendix B") and typing in SPD1, etc in the first column of his printer driver. This does not generate the desired effect.

Probably the best method of achieving extra printer effects is to type a 'top bit set' character into the text and then, in the printer driver translations of the printer driver file, type the same top bit set character in the first column (where D Hunt has typed in SPD1 etc) and the long string that switches in or out the printer effect as the translation. I shall be grateful for any alternative suggestions for increasing the number of printer highlights.

OFF at CR

The 'OFF at CR' option within the printer driver affects only the printed output. It does not generate the same effect on screen. For example, if you change the printer driver so that italics are not turned off at <CR> and place one highlight at the beginning of the first line of your document, you will find only the line containing the highlight code is in italics on the screen but the printed output will all be italics. This is because PipeDream does not read the 'OFF at CR' column of the printer driver file before displaying on the screen.

RISC-OS Printer Drivers

The old Acorn anti-aliased fonts (sometimes called 'Fancy Fonts') were bit mapped on screen and have now been replaced by a much superior method called 'Outline Fonts' in which every letter is stored as a picture which can be drawn with full resolution

at any scale. If you are going to use the RISC-OS drivers then I strongly recommend that you change over as soon as possible to the new outline fonts. A starter set is available through Archive (Font Starter Pack = £47) and more will become available (New Hall = £47 – also PD fonts + utilities disc is in preparation – £3 or £6). I got mine by buying Acorn's DTP (from Archive for £145) which includes this starter set of fonts. More about the techniques for and benefits of exporting from PipeDream to Acorn's DTP in another issue.

The Acorn fonts are all for the Latin 1 character set so you cannot (yet) generate the Bfont or Greek characters. Having got the text onto the screen you then need a RISC-OS printer driver for your printer. Acorn have supplied some for 9-pin and 24-pin printers and one for the HP LaserJet. I use an Epson GQ-3500 in HP emulator mode but other PipeLine readers have sent me letters printed out using the RISC-OS HP LaserJet driver with the much cheaper (but slower) HP DeskJet Plus. I am impressed by the quality and recommend it to you as a cheap alternative to a laser printer. Of course you can dump !Draw files to a DeskJet at high resolution with the Acorn RISC-OS HP LaserJet driver.

The way that the RISC-OS printer drivers work should not be confused with a screen dump. The characters that you see on screen are not bit mapped but are drawn from a set of lines. When you print these characters they are redrawn (in memory) at the full resolution of the printer and the bit map sent to the printer is at the resolution of the printer and not at the resolution of the screen. The picture of the letter which you see on the screen and which gets sent by the RISC-OS printer driver to the printer are generated by the Acorn Font Manager and not by PipeDream. PipeDream 3 integrates beautifully with Acorn's outline fonts and RISC-OS printer drivers.

Philip Mott has sent me a disc copy of a RISC-OS printer driver for a Shinwa CP80 (in addition to a PipeDream printer driver for the same printer). I have included his contribution in a subdirectory called Mott on the Archive monthly disc and, those of you with the necessary skill will see how his technique could be used to write RISC-OS drivers for many other printers. Another personal

plea. Has anyone written a RISC-OS driver for the Epson GQ-3500 so that I can use mine without the HP emulator plugged in?

Summary

System font character sets are an 8 by 8 matrix of pixels (like a small sprite), outline fonts are drawn (like a small !Draw file). All characters are stored by PipeDream as a character code between 0 and 255 not as a sprite and not as a drawn picture. These character codes can be sent to a PipeDream printer driver (and, if you want, can be translated into other codes at the printer). If you are using outline fonts then it is these drawn pictures which are redrawn at the printer resolution and sent to the RISC-OS printer driver.

Help wanted

How to print greek characters on an HP InkJet+? How to print the row numbers? How to print anagrams, subgrams or a dictionary? **A**

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SCSI Column

Paul Beverley

There seems to have been something to say about SCSI almost every month recently, so I thought we might as well have a separate column.

Don't buy SCSI, buy ST506!

The following recommendation was pointed out to us by a number of readers. It comes from some sales literature from Beebug Ltd.

"SCSI drives for A3000, A310 and the A400 series are now available from Beebug. Please phone to discuss your requirements and for prices. We suggest that ST506 drives (such as those supplied by Beebug) are probably a more sensible alternative than SCSI for the majority of users. The advantages of SCSI drives are that they can be very fast (but of course at a high price) and that a number of drives and other devices can be connected in parallel. SCSI drives are accessed via a filing system which may not be as convenient or as powerful as the ADFS filing system provided by Acorn. If you require very large storage capacity (greater than about 70Mb) then SCSI is the way forward."

I spoke to Ian McDougal at Beebug who said that they hadn't actually got any SCSI drives in stock but that they could order them. Also, he couldn't give me any prices except for A3000 (£771 for 45M and £966 for 70M). When pressed as to why they were not recommending SCSI, he said that there had been some problems building the SCSI interfaces for the Archimedes and that they would rather deal with the "proven technology" of the ST506 drives.

Not as powerful as ADFS?

To say that SCSIFS "may not be as powerful as ADFS" is simply not true. The structure of both filing systems is set by filecore. In fact, this statement is at odds with the comments made by Mike Williams (Risc User's Co-Editor) in his article in Risc User Issue 3.3 p 8, where he says "SCSIFS... is functionally identical to the ADFS."

SCSI more expensive?

As regards price, I would quote again from Mike's article in which he says, "For A3000 owners, a SCSI hard disc upgrade may prove cheaper than

any other alternative." If you look at the Archive price list, you will see that prices of the 20M drives for 300/400 computers are about the same for SCSI as for ST506 but for 40M drives or larger, SCSI is markedly cheaper. The 410/1's have an ST506 hard disc controller on board, so it is at least worth considering putting an ST506 drive on it for economic reasons, but with the 305/310's and the A3000's, the complete lack of ST506 hardware pushes the argument very much in favour of SCSI. In fact, we don't even bother to stock ST506 drives for A3000.

SCSI less convenient?

Problems can arise with SCSI, however, when applications have not been written in such a way as to be file-system independent. Even so, all you have to do is to switch over with *SCSI or if that fails, use *killADFS, after which all commands are directed to the SCSI filing system. The only situation where you really have to exercise your brain is if you are wanting to work with floppies and hard discs in the same application. Basically, you have to find some way to specify ADFS::0.such-and-such and SCSI::4.such-and-such within the software.

One of the readers who drew my attention to Beebug's "most peculiar statement" also said that he had not found any "inconvenience" in the SCSI filing system that he is using and that to most applications, SCSI is virtually transparent. "The only package I have found that does not work correctly under SCSI is Hearsay (from Beebug)!". However, my version of Hearsay seems to work OK with SCSI – apparently, it was the copy protection that did not work with SCSI and so they have made it so that it can just be copied straight across onto a SCSI drive. (If your version of Hearsay does not work, why not ask Beebug for a version that does? – Mine announces itself as version 2.00, March 89, but I suspect that this is not accurate since the !RunImage is dated 17 Nov 1989.)

If anyone is having problems running any other software on SCSI drives, please let us know – we may be able to give you a 'work-around'.

So, why choose ST506?

There seems to be very little left of the statement on

Beebug's sales literature that would support a choice of ST506 in favour of SCSI. This is the view held by all the people "in the know" that I have spoken to recently – see also Brian Cowan's comments last month (Archive 3.5 p21). So, why recommend ST506 rather than SCSI? Anyone got any ideas?

Acorn SCSI card

The Acorn SCSI card is now available – we have one in stock! Although it is more expensive than Oak or Lingenuity by £100, you can get a free MEMC1a upgrade if you need it (which has to be fitted by the dealer supplying the Acorn board). It is, in some ways, slightly faster even than the Oak interface (see below) but it has a couple of minor drawbacks.

Firstly, it uses a different connector from Oak, Lingenuity and Computerware. Acorn have chosen to use the more expensive 50-way Centronics type connectors as used on the Apple Mac, so you cannot just buy, say, an Acorn interface and a Computerware SCSI drive. If people are interested in buying the Acorn card, we can see if we can get someone to make up some cables.

The other slight draw-back is that the board does not have an internal connector so if you want to use an internal SCSI drive you will have to put the connector on the outside and feed the cable back in through the back of the computer. That's not too much of a problem but it is compounded when you want to start daisy-chaining drives or other devices.

I gather there have been some problems when running more than one of the very large drives (i.e. 200Mb or more) from a single Acorn SCSI card – but that isn't likely to affect many of us!

Computerware SCSI drives?

Not available yet, I'm afraid, but they hope to have them available soon.

New world speed record??

Oak Computers are currently trying out a 640 Mbyte SCSI drive. They have got it working OK but they have had to format it down to 512 Mbyte since that is the maximum capacity that filecore can keep track of! They find that on their podules, it will run at 1,570 kbyte/sec. Is this a record, or does anyone know of anything faster?

More speed tests (yawn!)

Having got hold of a cable to connect an Oak drive to an Acorn card, I have been able to do a few more comparative tests. I used the same 45M drive to test Oak, Lingenuity and Acorn podules, the only difference being that I had to reformat the drive for the Lingenuity podule as it is rather slow when using the 1:1 interleaving that the faster podules use.

The first test was the one we have used before where large files are loaded and saved. This just gives a rough measurement of the data transfer rate in kbyte/second. This varies in the different graphics modes and so three sample modes (0, 15 and 21) are used in the test. The results are as follows:

Mode	0	15	21
Oak	655	655	56
Acorn	655	655	453
Lingenuity	355	355	67

As you can see, the Acorn board wins out over the Oak board in mode 21. This, we think, is because it has more ram on it for buffering the data transfer. In other words, it is much easier for it to take data off the bus when it is available rather than having to wait for the availability of the data and the readiness of the drive to coincide. (This is less of a problem with larger drives because they usually have their own internal ram buffer which makes the data transfer much more efficient when the Archimedes' data bus is being heavily used.)

A fairer test?

I said in an earlier issue (Archive 3.4 p 15) that it might be a more realistic test of the speed of the drives to do something that involves handling a number of files rather than just loading one very large file. I set up a test but had problems implementing it on the Lingenuity drives. These problems have now been overcome and anyone with a version of the Lingenuity software before 1.21 should contact them (not us!) with a view to getting it upgraded because the error, in our case, necessitated a complete reformatting of the drive!

The test involved taking the contents of a floppy disc, storing it in one directory and then recording the time that it took to copy the complete contents of that directory into another directory. To make the test reproducible by other people, I have used to of

the commonly available discs: (1) the RISC-OS Applications Disc № 2 and (2) the RISC-OS Support Disc. Both the discs contain about 420k of data but Applications Disc 2 only has 65 files whereas the Support Disc has 209 files. The results, which show the time in seconds to do the transfer (in mode 12), are really quite interesting.

	(1)	(2)
Oak	10.1	37.6
Acorn	18.4 (55%)	65.6 (57%)
Lingenuity	14.7 (69%)	53.3 (70%)

(Oak Computers ran the same tests for me on a 330M SCSI in mode 12 and the results were as follows:

	(1)	(2)
Oak	7.9	33.8
Acorn	15.4 (51%)	57.2 (59%)

which, as you see gives roughly the same ratios.)

The Acorn podule, although it runs at the same basic data transfer rate as the Oak podule, is only about half the speed when it comes to file handling. In other words, the file handling overheads make a significant difference in use.

For the Lingenuity podule, although the data transfer rate is only 54% of Oak's podule, when the file handling overhead are taken into account, it is only 30% slower than Oak and ends up running faster than the Acorn podule!

No one I have spoken to has been able to explain why there should be such a difference between the two cards since so much of the coding is within filecore itself which is used by both cards. We thought it might be the size of the dircache but we found that although increasing and decreasing it changed the timings by a few percent, the ratio between the two timings stayed roughly the same. I then tried the tests using a 410 with an ARM3. With the ARM3 cache switched on, the Oak board ran the test some 12% faster whereas the Acorn board only speeded up by just over 1%. Come on, all you experts! Tell us why the Acorn board is, relatively speaking, so slow.

Lingenuity A3000 podules

Apologies to those of you who are waiting for the Lingenuity A3000 podules but there has been a delay in supplying them. Apparently, the first complete batch of boards that were made have been supplied to Cumana for use with their removable hard drives (see Archive 3.5 p21). I hope we will have some podules available by the time you read this, but Lingenuity could not make any promises.

Over to you

If anyone has any information about forthcoming SCSI products or any questions to ask or views to express, please write to me at the Archive office or via the BBS on the new Norwich number. A

First Word Plus Column

Stuart Bell

In addition to the numerous kind people who responded to my 'Open Parent' oversight in January's FWP2 review – and who also mentioned that 'close with adjust' also opens that directory's parent – numerous other letters have arrived in response to the last two FWPlus Columns.

Sandie the Walrus(!) is far more impressed with the wordprocessor within Impression than with FWP2. He sent me a letter produced on a 9-pin dot matrix printer but output via the RISC-OS drivers which Impression uses, to make his point. Quite frankly, I was amazed by what a Star LC10 produced, driven with suitable software. A discussion on upgrade policies followed (RAM or Printers or DTP?),

which only served to make me jealous. (Yes, Paul, I know all about Genesis 20:17).

Killing modules, Part 2

Both Sean Kelly and Clive Williams wrote in with a solution to the problem which I mentioned last month, whereby FWP2 leaves modules cluttering up the module area, with the effect that after terminating FWP2, I cannot load other applications that wish to load their own 'private' modules.

The answer is to place the line

```
RmKill ModuleName
```

in the !Run file of the application in question, at a point after the application has been invoked. For example, my FWP2 !Run file currently ends like this:

```
WimpSlot -min 416k -max 496k
Run "<FirstWordPlus$Resources>
      !RunImage" %*0
```

If I now append the following lines, the module area should be cleared when FWP2 is terminated:

```
RMKill WindowUtils
RMKill ColourTrans
RMKill FPEmulator
RMKill SharedCLibrary
```

However, as Sean points out, this works quite nicely but there is a serious problem if any other resident application uses the modules that you have just killed! As he says, 'the automatic killing of modules would usually be most dangerous.' In particular, the Shared C Library is used by many other applications.

In summary, on a 1Mb system, this auto-kill technique might be worth using, since you are not likely to be multi-tasking another significant application with FWP2. On larger machines you might well be, but then you are likely to be much less worried about an over-large module area. Sean points out that by amending every !Run file on your system, you could declare a system variable for each module, which is incremented for each RMLoad or RMEensure, decremented at the end of every relevant !Run file, with the Module only being deleted when the count became zero, implying that no currently active applications were using it. You might like to try this approach but I suspect that it could lead to a fragmented module area, with many small bits of unused memory, so that the net benefits would be limited.

FWP2 – The first bug?

A.A.Hoosen has written from Hong Kong with a bug in FWP2. With double spacing set, he finds that underlining which is set over two lines also appears on the blank line, thus:

The cat sat

on the mat.

Although there's no problem on the screen, on printing that's just what happens. He asks for a work-around. I find that if after re-formatting non-underlined text you select each line individually to be underlined, then the problem doesn't appear. Moving the cursor around the text with the FWP2 keypad's 'underline' flag visible shows that the two

spaces stored on the blank line are not then underlined. In the FWP manuals (FWP1 p.226 and FWP2 p.142), it is recommended that you let FWP control the underlining, in preference to sending 'underline-on' and 'underline-off' commands to your printer, as the printer may not underline spaces properly. A consequence of this would seem to be Mr Hoosen's problem!

But not the last!

A number of folk have problems which at first sight seem specific to their particular system. David Crofts reports that the 'sheet-feed bug' – form feeding after each line on the second page – has reappeared, forcing him to resort to FWP1 again. He's using an Epson LQ1050 printer. My first inclination is to suggest that the Epson itself is initiating the form feeds because it 'thinks' that it has filled the first page. Disabling automatic form-feeds in the printer might do the trick, but the quick solution is to ask if anyone else with an LQ1050 has encountered – and defeated – the problem. If you've not hit this bug, perhaps you could let us know what driver you're using and what switch settings in the printer.

B R Wilson points out that !stChars shows all the 'weird' characters, not just the ones that your particular printer-driver can produce. This he sees as a disadvantage, and seeks a work-around – although I must point out that it does give printer-independence when producing text.

Finally, Phillip Hughes, also has problems with an Epson LQ printer – this time an LQ850, with FWP1. The test prints seem to suggest a line feed problem with graphics output, in that there is a blank line between each pass of the print head. Again, a hunch suggests a problem with the printer configuration, but we really do need comments from an LQ850 user. If your graphics work OK, then please let us know exactly what driver you are using and what switches are set to what in the printer itself.

Thanks to all who have written to me this month; I hope that you will accept quotation in the column as your reply. To save Paul and Sue re-directing everything, a reminder that I'm at 56 Crescent Drive North, Woodingdean, Brighton, BN2 6SN (no phone calls, please), and would be glad to receive hints, problems, wishes and cries for help, and especially help from LQ850 and LQ1050 users, by about the 15th of each month if you want to make the next issue. **A**

Competition Corner

Colin Singleton

Beer pouring winners

An encouraging response, in quality if not in quantity, to the beer-pouring problem in December. Several readers solved the published problem with 40 pourings, and the intended version with 60. One entry, unfortunately, had to be disqualified, because it did not guarantee optimum solutions, though it did mysteriously manage to find them for a number of specific problems.

The winner was Keith Miller, not so much for the magnificent quality of his Wimp presentation but because his stood out as the most effective program for this type of puzzle. I was a little disappointed that none of the programs submitted was able to tackle the similar problem with three small barrels instead of two. It can be done with a 1M Archimedes.

Congratulations Keith! And to Keith and everyone else, keep puzzling.

3D jigsaw puzzle

After the jigsaw puzzle with squares in January, and the dice puzzle last month, a three-dimensional jigsaw puzzle with cubes! No, it is not as horrendous as it sounds, but you will have to decide how to tackle it. Probably not by computer.

Imagine (or make) a set of twenty wooden cubes, 1x1x1, 2x2x2, ..., 20x20x20. I want a box to keep

them in. Specifically, I want a rectangular box with the smallest possible volume. That's it, really!

Since we have some space to spare (on this page, as well as in the box), here is a quickie (read it carefully):

What is the smallest (by area) integer-sided non-square rectangle which can be dissected into several smaller integer-sided non-square rectangles, no two of which have an edge-length in common? (The prohibition on equal edge-lengths does not only apply to edges which are adjacent.)

Entries (the dimensions of the box on your local picture postcard will do to start with), and comments on Archive Competitions past, present or future, either via Paul at NCS, or to me at 41 St Quentin Drive, Sheffield S17 4PN.

Corridor competition winner

Remember the corridor competition many moons ago that Steve Picton set for us? Well the winner of that was Hans Kommeren of Breda in Holland. We have sent him an Archive voucher for £20. The corridor width is 1.231185723778668829962705 83476978887456864902699763 m. Hans went to the trouble of writing a 192 bit binary floating point ARM code program to compute the result and it produced the answer in 25.08 milliseconds! A

Contact Box

- **Archimedes Users' Groups** – Does your area have a local user group or computer club? Are you interested in starting up a new club in your area or getting in contact with other Archimedes users? If you send your name and address along with other relevant details to John Brocks, 92 Queenhythe Road, Jacobs Well, Guildford, Surrey, GU4 7NX then he will collate all the addresses by area and put people in touch with each other.
- **Archimedes users in Somerset?** I would like to start/join a club. Contact Mick Tillbrook, 42 Normandy Avenue, Watchet, TA23 0TU, phone 0984-34150.
- **BOGBUG** – Borough Of Gosport BBCs' User Group has re-started. Anybody interested in joining should contact Graham Hobson on 0705-511056 during office hours.
- **Leicester Archimedes Network** has been meeting on a regular basis since 1987 on the first Thursday of each month at DataNest, 1-9 Market Approach, Leicester, LE1 5EH. (0533-539755)
- **Wakefield BBC User Group** (includes Archimedes) – details from The Secretary, Wakefield BBC MUG, 1 Wavell Garth, Sandal, Wakefield, WF2 6JP. A

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- **A410/1 colour**, 4 months old, hardly used, £900. David Wilson 0273-697522.
- **Arc software** Pacmania £9, Alerion £7, Terramex £9, Zarch £6, PC emulator £50. Andy on 0473-216424.
- **Brother M1009 printer** £50, FWPlus v.1 £25. Phone 0923-224650.
- **Juki 2200 daisywheel t-writer/printer**, bargain at £100 or offers. Andy on 0473-216424.
- **PC Emulator 1.33** (unregistered) + 10 disks Dabs Press PC Shareware, £50 o.n.o., Cambridge Hyperpack (12 games) £50 o.n.o. Graham Evans on 0685-70098.
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Introduction to 'C' – Part 5

Chris Dollin

In this article, I shall depart from my earlier approach of discussing machine-independent C and use, as my example, a simple desktop application written using the facilities provided by Release 3 of Acorn C. The complete program will be available on the monthly program disc. (If you don't want the program disc, send me a blank disc and I will return it with the complete application.) This is rather in the nature of an experiment, so please let Paul or me (c/o Archive) know how well you think it has worked!

The application is called "Sysvars", and it is a system variable browser; that is, it allows the values of system variables to be inspected in a scrolling window, rather than having to use an Edit task window or temporarily leaving the desktop with <f12>.

Building !Sysvars

!Sysvars is a standard RISC-OS application. As such, it is a directory containing a collection of standard files with standard names.

"!Boot" should be an Obey file containing:

```
Iconsprites <Obey$Dir>.!Sprites
```

This sets up the sprites which are used by the window manager to display the application icons. This must contain a sprite called "!Sysvars". Any sprite 34 wide by 17 high will do: if anyone can think of a pretty picture that would be appropriate, let me know. (My own sprite just has two text lines saying "?Sys" and "Vars" – pretty wimpy.)

"!Run" should be an Obey file containing:

```
RMEensure SharedCLibrary 3.00
RMLoad System:Modules.Clib
RMEensure SharedCLibrary 3.00
Error You need Clib 3.00 or
later
```

```
|
WimpSlot -min 100k -max 100k
IconSprites <Obey$Dir>.!Sprites
Set Sysvars$Dir <Obey$Dir>
Run <Sysvars$Dir>.!RunImage %*0
```

This ensures that the shared C library is loaded, sets up the wimp slot correctly, does the IconSprites

again (just in case), sets up a system variable pointing to the application directory (this is used by the C Wimp library routines) and finally gets to run the program itself.

"!RunImage" should be the compiled form of the program described below. When compiling, remember to use the "-I" option to tell the compiler where you have placed the RISC-OS C library headers and, when linking, you must tell the linker where the window manager library is.

Finally, "Templates" should contain the templates used by the C Wimp library routines for the windows. There are three required by !Sysvars: ProInfo, Variables and Text. You will normally construct the Templates file using the !FormEd application supplied with Release 3 of C. I constructed mine by hacking the ones that came with the Release 3 examples.

"ProgInfo" should contain a writeable icon (#4) into which the version information will be placed. It should also contain text icons giving the program name, purpose, and author.

"Variables" should contain a writeable text icon (#0) into which the user can type the variable patterns they wish to see and a (non-writeable) text icon for a label.

Finally, "Text" is a plain new-format window with auto-redraw switched off.

(The supplied "!Sysvars" comes with the C source and a makefile to (re)build it – just double-click on the "!Build" file.)

The Sysvars application code

We start by #includeing assorted parts of the RISC-OS library provided with Release 3. (For details of how to tell the compiler where to find these files, see the Release 3 manual.) We must include (in no particular order) the standard ANSI files *stlib.h*, *stdio.h*, *string.h* and the Acorn wimp files *wimp.h*, *wimpt.h*, *win.h*, *event.h*, *baricon.h*, *res.h*, *resspr.h*, *menu.h*, *template.h*, *dbox.h*, *werr.h*, *txt.h*, *flex.h*, *heap.h* and finally *visdelay.h*. (See the Release 3 manual for details of the functions provided by these headers).

Next we must define the positions of items within menus and dialogue boxes; by using named constants, we make further development of the program easier. (As a general rule, "magic numbers" should not appear in code, only in definitions.)

```
#define Example_menu_info 1
#define Example_menu_filter 2
#define Example_menu_quit 3
#define Filter_Variable 0
#define Example_info_field 4
```

We now set up a variable to hold a version identification for the program; this is displayed in the Info dialogue box of the program later on. (The keyword *static* makes sure that the variable is not accessible outside this file; it prevents unexpected interactions with other components of a large program.)

```
static char *example_Version_String
= "1.01 (21st January 1990);
```

We declare a *menu* object (to hold the icon-bar menu) and a *txt* object (to hold the display of variable values), initialising them to "suitable zeroes". (In fact both of these types are pointers.) The notation (*Type*) *Value* is called a *cast*, and it forces the given *Value* to be treated as having the given *Type*.

```
static menu example_menu = (menu) 0;
static txt a_text = (txt) 0;
```

The variable *Filter_Variable_String* will hold the pattern used to select the variables to be displayed in the browser.

```
static char Filter_Variable_
String[100];
```

Displaying the values

Release 3 C provides text buffer objects which can be used to hold and display text in the same way that !Edit does. Rather than writing code ourselves to display characters, refresh, resize and so on, we shall use these *txt* objects to do the job for us. Each time we want to display a new set of system variables and their values, we empty our *txt* object and then insert a line for each variable.

The function *sysvars_to_text* will display the values of variables matching the pattern in *var_filter* in the text buffer *t*. The buffer is first cleared using *txt_setdot* and *txt_delete* (there does not appear to

be a simple *txt_clear* function). Then repeated calls to OS_READ_VAR_VAL (see the PRM if you want more details) are made to extract the value of all the variables matching the pattern (a string possibly containing wildcard characters, such as might be given to *SHOW) in *var_filter*; then the string "Name=Value\n" is inserted in the buffer for each such variable and its value. During the search, the hourglass is displayed, using *visdelay_begin* and *visdelay_end*.

```
#define OS_READ_VAR_VAL 0x23

static void sysvars_to_text( txt t,
                           char *var_filter )
{
    char buffer[255];
    os_error *err;
    os_regs regs;
    regs.r[0] = (int) var_filter;
    regs.r[1] = (int) buffer;
    regs.r[3] = (int);
    txt_setdot( t, 0 );
    txt_delete( t, txt_size( t ) );
    visdelay_begin();
    do
    {
        regs.r[2] = sizeof( buffer );
        regs.r[4] = 3;
        err = os_swix( os_X | OS_READ_
                       VAR_VAL, &regs );
        if (err == NULL && regs.r[2]>0)
        {
            buffer[regs.r[2]] = '\0';
            txt_insertstring( t, buffer );
            txt_insertstring( t, " = " );
            txt_insertstring( t, (char *)
                              regs.r[3] );
            txt_insertstring( t, "\n" );
            txt_setdot( t, txt_size( t ) );
        }
    } while (err == NULL);
    txt_setdot( t, 0 );
    visdelay_end();
}
```

The function *example_iconclick* will be called when <select> is clicked on the applications icon on the icon-bar. It assigns a new *txt* object to *a_text* if it has not already done so, making sure that it will be displayed on the screen; note the use of an embedded assignment. *txt* objects have titles

(displayed, of course, in their window's title bar); the title of the *txt* is set to the string used as a variable name, and *sysvars_to_text* called to put the variables and their values into the *txt*.

```
static void example_iconclick
    ( wimp_i icon )
{
    if (a_text == (txt) 0) txt_show
        ( a_text = txt_new
            ( "<unset>" ) );
    txt_settitle( a_text,
        Filter_Variable_String );
    sysvars_to_text( a_text,
        Filter_Variable_String );
}
```

Information and Dialogue boxes

A dialogue box is a window used to display information to, and obtain information from, the user. Release 3 C contains some functions for simplifying the creation and use of dialogue boxes. Each dialogue box has a collection of *fields* (typically text icons) which can be read with *dbox_getfield* and written with *dbox_setfield*. The fields are specified with numbers (corresponding to the number of the icon in the window; these are set up when the dialogue box window is created with !FormEd).

When the INFO option on the icon menu is selected, *example_info_about_program* is called to display a dialogue box which contains the program version (from *example_Version_String*) and other information (held in the templates).

```
static void
example_info_about_program(void)
{
    dbox d = dbox_new( "ProgInfo" );
    /* Dialogue box handle */
    if (d != NULL)
        { /* It worked */
        dbox_setfield( d, Example_info_
            field, example_Version_String );
        dbox_show( d );
        /* Put it on the screen */
        dbox_fillin( d ); /* Wait for the
            user to finish with it */
        dbox Dispose( &d ); /* Throw it
            away */
    }
}
```

When the FILTER entry of the icon menu is selected, *example_set_filters* is called to display the current setting of *Filter_Variable_String* and allow it to be modified.

```
static void example_set_filters(void)
{
    dbox d = dbox_new( "Variables" );
    if (d)
        {
        dbox_setfield( d, Filter_Variable,
            Filter_Variable_String );
        dbox_show( d );
        dbox_fillin( d );
        dbox_getfield( d, Filter_Variable,
            Filter_Variable_String, 100 );
        dbox_Dispose( &d );
    }
}
```

Responding to menus

When a selection is made from a menu, Release 3 C calls a menu handler function. This function takes two arguments: a pointer to some "useful information" that the programmer has specified – we'll see how later – and a pointer to an array of characters holding the numbers of the items selected. I say 'numbers', not 'number', because menus can be nested. Characters are used (as small integers; that's all C characters are) because no menu should contain anything like 256 entries.

The "useful information" pointer has the novel type *void**. Now, since we've said that *void* is used as the type of a function that returns nothing, you might expect it to mean "pointer to nothing": instead, it means "pointer to anything". This is an artefact of the historical development of C. Since we don't use the information in our menu handler, we shall say no more about it.

We arrange that when an item is selected from the icon menu, *example_menuproc* is called. Since our menu is not nested, only *hit[0]* is important. The *switch* statement is like a multi-way *if*; the statements labelled, by *case Value*, with the appropriate value, appearing after the *switch* keyword, are selected. The *break* statement leaves the entire switch. It can also be used for quitting a loop, but this is not recommended practice. Note that after the filter is set, the system variables are re-displayed if a text window already exists. The standard procedure *exit* exits the program.

```

static void example_menuproc(void
                           *handle, char *hit)
{
    handle = handle; /* this stops
                      compiler warning */
switch (hit[0])
{
    case Example_menu_info:
        example_info_about_program();
        break;

    case Example_menu_filter:
        example_set_filters();
        if (a_text) example_iconclick(
            iconclick( (wimp_i) 0 ) );
        break;

    case Example_menu_quit:
        exit(0);
        break;
}
}

```

Setting up

Before the windowing routines can be used, they must be initialised. This consists mainly of calling all the appropriate “init” functions, setting the variable string to “*”, which matches all names, creating a menu and setting up the sprites and icon.

If the initialisation is successful, the value TRUE (non-zero) is returned; otherwise FALSE (zero) is returned.

The function *strcpy* copies the string given as its second argument into the character array given as its first argument. There’s a similar function, *strcat*, which appends, or concATenates, its second argument onto the end of its first. As usual in C, it is the programmer’s responsibility to ensure that there is enough space available.

menu_new constructs a new menu object. It takes two string arguments: the first is the title of the menu and the second is a description of the contents of the menu. So far as we are concerned, this description is a series of items separated by commas; each item is a name possibly preceded by a greater-than sign.

When the menu is displayed, the items will be shown. Those preceded by “>” will have the little sub-menu arrow pointing off to the right; they are selected either by clicking on them or by sliding the

pointer onto the arrow. (It is possible to arrange for sub-menus to be automatically displayed.) Plain menu items are displayed without any arrow and are selected by clicking.

menu_new returns a menu object (pointer) unless something goes wrong, otherwise it returns NULL (0). No menu is actually displayed at this point. The C manual advises you to create as many menus as possible when the program starts up, to avoid possible problems due to running out of resources later on.

baricon is used to attach an icon to the icon bar. The first argument is the name of the sprite to use as the icon and the second is the address of the sprite area where it is found. 0 means the system sprite area (now obsolete) and 1 means the Wimp sprite area, where the “!Sysvars” icon has been placed when “!Run” was executed. The third argument is the function to call when the user clicks <select> on the icon. The ability to pass functions as parameters, embed them in data structures, and return them as results allows a particularly flexible programming style not possible in Pascal and difficult at best in BASIC.

Finally, *event_attachmenu* allows a menu and menu handler to be attached to a window. The first argument is the window; *winICONBAR* is a special name for the icon-bar window. The second argument is the menu to use – here the one we stored in *example_menu*. The third argument is the function to call when a menu even occurs and the fourth is the “useful information” we discussed earlier, here 0. If the menu has been properly attached, TRUE is returned, otherwise FALSE; “!” is C’s “not” operator.

```

static BOOL example_initialise(void)
{
    flex_init();           /* Flex store
                           management */
    heap_init( TRUE );   /* Heap store
                           management */
    wimpt_init("Sysvars browser"); /*
                           Main wimp initialisation */
    res_init("Sysvars"); /* Resources */
    resspr_init();        /* Application
                           sprites */
    template_init();      /* Templates */
    dbox_init();          /* Dialogue boxes */
}

```

```
visdelay_init(); /* For the
                  hourglass */
strcpy( Filter_Variable_String,
        "''");
if ((example_menu = menu_new(
    "Example", ">Info,>Filter,
    Quit")) == NULL)
    return FALSE;
baricon( "!Sysvars", 1 /*Wimp sprite
    area */, example_iconclick );
if (!event_attachmenu( win_ICONBAR,
    example_menu, example_
    menuproc, 0 ))
    return FALSE;
return TRUE;
}
```

Finally, *main* simply initialises. If this is successful, it loops calling *event_process*, which handles all the

mouse-clicks, sending events to the functions which handle them.

```
int main( int argc, char *argv[] )
{
    if (example_initialise())
        while (TRUE) event_process();
    return 0;
}
```

Winding up

That's it for this month. Next month, I expect to tidy up some of the loose ends from the previous articles, in particular, dealing with independent compilation and the use of header files. After that, I'd like to tackle any topics that you feel are important for your understanding of C, so write and let us know what you want to hear about. **A**

DTP Column

Ian Lynch

Firstly, solutions to some problems posed by Ken May of Brighton.

!Draw to Acorn DTP

He rightly notes that !Draw allows characters to be stretched and squashed (technically, the aspect ratio is being altered) but Acorn DTP does not allow this. So how can he get some elongated letters into his document?

Unfortunately, transferring !Draw files only transfers the characters with the standard aspect ratio so this will not help. My solution is not entirely satisfactory but it will work. Use the screen save facility on !Paint (click <menu> on the !Paint icon on the icon bar) to screen save a snap shot of the required letters from !Draw. This can then be transferred to DTP as a sprite. The draw-backs are that a sprite consumes a lot of memory and obviously the text so treated cannot be edited. !Impression allows text aspect ratio to be adjusted and so this is a feature which may make it more useful to some.

From BASIC to ADTP?

Ken goes on to ask how he can transfer diagrams and graphs drawn in BASIC programs into DTP. The most efficient way would be to transfer the drawings into !Draw file format and import.

However, this is not too straight forward without some specific programming knowledge.

An alternative is to screensave the drawing and then import it as a sprite, perhaps after editing it in !Paint. This can take up quite a lot of memory depending on the screen mode, etc. Don't forget to change the desktop palette to that of the sprite by going to Save and palette on the sprite menu and dragging the palette into the palette icon on the iconbar. It is probably best to use !Draw and the likes of Graphbox from Minerva or Presenter II from Lingenuity to produce the graphics unless the particular diagrams are impossible to produce in this way. Graphics programs are in good supply and they usually make life much easier than BASIC programming. As Ken would like to write a mathematics text book he could use some mathematical fonts. Any offers?

Impression H & T's

I have been passed on some hints and tips for Impression users by Tim Powys-Lybbe. Impression comes with a "newmodes" module and Tim recommends mode 82 for multiscan users as it enables more to fit on the screen. On a different tack, it is quite nice to be able to customise directories so that commonly used resources are readily at hand. This is particularly useful for hard disc users. Tim makes some specific suggestions, but perhaps the prin-

ciple behind these is best explained and then you can decide for yourself the exact way you want to implement this versatile aspect of the Archimedes.

If you regularly use a particular directory, you can arrange to start up any application so that it will provide a viewer window open on this directory. Say you want a directory called Doc inside the !Impress directory to open every time you access Impression. Open the !Impress directory by holding down <shift> and double clicking on the !Impress icon. Now use the middle mouse button to produce the filer window and create a new directory called Doc. Load !Edit and drag !RUN from the !Impress directory into !Edit. After the line containing Wimpslot type

```
Filer_Open adfs::HardDisc4.$.  
! Impress.DOC
```

(You must name your HardDisc HardDisc4 for this or alter the name in the line above appropriately.)

Now save the !Run file and whenever you double click on !Impress, a window will open with your documents inside. This means that all documents to do with Impression are tidily organised within the applications directory. Of course you could also customise Acorn DTP or other applications in a similar way.

Tim also includes a program to do automatic backups of documents onto a floppy, an Impression document to gain access to the extended characters (if you hold down the Alt key and type the ASCII code for a character on the numeric key pad the character is displayed on the screen – this is general and not linked to Impression specifically). Tim has supplied an Impression file which gives a key for the codes to these characters. Another file produces a very nice function key strip and another a program for generating date-stamped letter heads. I have now got about 1 full (uncompressed) disc of Draw files so please keep them coming and I will pass them on to Paul for distribution.

How good is Impression 1.02?

Steve Drain has written in with some fairly severe criticisms of Impression 1.02 which he has been using intensively for about a week. I must say that I could not reproduce some of his listed bugs on the 0.92 version which I have been using so I will not go

into detail about these until I get 1.02 since bugs could have crept in between the two.

More generally, he criticises the lack of a consistent user interface in that Impression uses 3-D dialogue boxes and some non-standard buttons. He has had to reference the manual more than for other applications and has experienced several crashes. Dongle criticisms are similar to those already gone over. Preference for style in software, as I said in the last issue, is a very subjective and personal thing and I make no apologies for being a bit of an Impression fan. I like the dialogue boxes and I've hardly touched the manual apart from reading it thoroughly recently for review purposes.

I have introduced some very inexperienced users to Impression and intend to teach it to 11 year olds (after all most cope with Wordperfect 5.0 which is much more difficult to learn). The 0.92 version has not crashed on me or colleagues during serious work (though 0.7 did regularly!). Basically, it does the jobs I want to do more quickly and conveniently than anything else, particularly when using 1M machines.

Having said all this, it may not be for you but since Computer Concepts will refund your money if you are not satisfied, there is not too much to lose by having a trial run. (*This only applies if it is purchased direct from CC. Ed.*)

If you are not too desperate, Clare's Tempest will be available in the not too distant future and it has menus which are very like those of ADTP. Dave Clare assures me that it will run well on a single megabyte of memory and it has some enhanced features which make it more functional. It does not have a dongle though the colour chart system might be used as in Interdictor. I would also recommend you to get some hands-on experience before buying any software (particularly expensive items) as one man's meat is another man's poison, so to speak.

Finally, one use that I have put Impression to with surprisingly good effect is as a visual aid to lecturing. The scrolling is fast and the inclusion of graphics easy so you can replace an OHP if you have a large screen TV or video projector. Any size font can be used and you can even print out a DTP copy of the lecture notes for the audience. A full review will be in next month's Archive. **A**

String Sorting with OS_HeapSort

Ian Smith (Smith & Wiggins)

In my article last month I showed applications of the RISC-OS heap sort routine to sort whole numbers and characters.

I indicated that sorting strings using this sort routine requires an assembler routine to compare two strings to be passed to the SYS call to "OS_Heap Sort". Peter Cockerell's Assembly language book gives such a routine. I have used this in a procedure to provide a general string sort for any sized array of any length string up to 254 characters.

The program listing below sorts 12 strings of different lengths. It is on this month's program disk together with a second which generates 1200 strings of random length comprising up to 70 randomly generated upper case characters. This latter program sorts in under 2 seconds.

The code is similar to that used in last month's article with the new lines of code documented with REM statements. I have not documented the assembler routine which 'simply' does a character by character comparison up to the length of the shorter of the 2 strings being compared and sets the flags to indicate <>== and <> which OS_HeapSort uses. The addresses of the two strings to be compared are taken from the static block where they are stored and placed into registers R0 and R1.

```
10 REM >HEAPStr
20
30 REM Ian Smith
40 REM February 1990
50 REM Incorporating Assembler code
60 REM           by Peter Cockerell
70 REM A String Sort using RISC-OS
     built in Heap Sort
80
90 OS_Sort = &4F : REM SYS number
100
110 READ Num      : REM How many
     strings to sort
120 DIM Words$(Num) : REM Set up the
     array
130
140 PRINT " Original Data " : REM
     Read in and display the data
150 FOR Word = 1 TO Num : REM to be
     sorted
160     READ Words$(Word)
170     PRINT Words$(Word)
180 NEXT
190 PRINT
200
210 PROCassemblycompare :REM Assemble
     code to compare strings
220
230 Start = TIME
240
250 PROCStringSort(Words$()):REM Call
     the Sort procedure passing
260     REM the array of strings to
270     REM be sorted
280 Finish = TIME
290 Timetaken = Finish - Start
300
310 PRINT " Now Sorted " :REM Display
     data AFTER sorting
320 FOR Word = 1 TO Num
330     PRINT Words$(Word)
340 NEXT
350 PRINT
360
370 @%2
380 PRINT "Time taken : ";Timetaken/
     100;" seconds"
390
400 DATA 12
410 DATA Eratotherenes, Ian, Jonathan,
     Frederick, Sidney, Anabelle
420 DATA Frieda, Francis, Frances, Anne
     , Andrew, I
430
440 END
450
460 DEF PROCStringSort(RETURNS A$())
470
480 LOCAL Size%, R1%, Case%, W%, Word,
     MaxLength, Length
490
500 Size% = DIM(A$(), 1) :REM Find the
     number of strings to be sorted
510
520 MaxLength = 0:REM Find the length
     of the longest string
```

```

530 FOR Word = 1 TO Size%
540   IF LEN A$(Word)>MaxLength THEN
550     MaxLength = LEN A$(Word)
560   ENDIF
570 NEXT Word
580
590 MaxLength = MaxLength + 1:REM Add
      1 as we're going to add a NULL
600           REM character to the end
610
620 DIM Data Size%*MaxLength:REM Block
      of memory to hold the data
630 DIM Pointers% Size%*4 : REM block
      to hold pointers
640
650 Pos% = Data :REM Start of storage
      area
660 FOR W% = 1 TO Size% REM Copy the
      strings into this block
670   ?Pos% = LEN A$(W%):REM preceded
      by the LENGTH of each string
680   $(Pos%+1) = A$(W%) + CHR$(0) :
      REM followed by NULL Character
690   Pos%=Pos%+MaxLength: REM Move
      to next section of the block
700 NEXT
710
720 R1% = Pointers% OR (%1 << 30):REM
      Sort the pointers so set BIT 30
730 REM to construct the array of
      pointers
740
750 REM R0 holds the number of
      elements
760 REM R1 holds the address of list
      of pointers
770 REM R2 holds the address of the
      compare routine
780 REM R3 holds the address of the
      workspace compare needs, not
      needed here
790 REM R4 holds the address of the
      block holding the data to
      be sorted
800 REM R5 holds the size of each
      element to be sorted.
810 REM The maximum string length
      in this case
820 REM R6 would hold a workspace
      address if R5 is > 16K
830
840 SYS OS_Sort,Size%,R1%,strCmp,,,
      Data,MaxLength :REM
      Use OS_HeapSort
850
860 Pos% = Data :REM Copy the data
      back
870 FOR W% = 1 TO Size%:REM Just the
      reverse of before
880   Length = ?Pos%
890   A$(W%) = LEFT$( $(Pos%+1),Length)
      Length):REM Just copy what
      we need
900   Pos% = Pos% + MaxLength
910 NEXT
930 ENDPROC
940
960 DEF PROCassemblecompare
970
980 REM This routine is a direct
      copy of the routine in Peter
      Cockerell's
990 REM Book on ASSEMBLY LANGUAGE
      PROGRAMMING for the ARM
1000 REM It is therefore the
      copyright of the Publisher's MTC
1010 REM I've just put the relevant
      bit into a PROCEDURE with
      LOCAL variables
1020 REM to make it self contained.
1030
1040 DIM org 200, buff1 100, buff2
100
1050 LOCAL str1,str2,len1,len2,index,
      flags,char1,char2,sp,link
1060
1070 str1 = 0:str2 = 1
1080 len1 = 2:len2 = 3
1090 index = 4
1100 flags = len2
1110 char1 = 5:char2 = 6
1120 sp = 13
1130 link = 14
1140
1150 FOR pass = 0 TO 2 STEP 2
1160
1170 P% = org
1180 [ opt pass
1190 .strCmp
1200 STMFD (sp)!, {str1-char2,link}
1210 LDRB len1,[str1],#1
1220 LDRB len2,[str2],#1
1230 CMP len1,len2
1240 MOVG len1,len2
1250 MOV flags,pc
1260 MOV index,#0
1270 .strCmpLp
1280 CMP index,len1

```

```
1290 BEQ strCmpEnd
1300 LDRB char1,[str1,index]
1310 LDRB char2,[str2,index]
1320 ADD index,index,#1
1330 CMP char1,char2
1340 BEQ strCmpLp
1350
1360 STR pc,theFlags
1370 LDMFD (sp)!,{str1-char2,pc}
1380
1390 .strCmpEnd
1400 TEQP flags,#0
1410
1420 STR pc,theFlags
1430 LDMFD (sp)!,{str1-char2,pc}
1440
1450 .theFlags
1460 EQUD 0
1470 ]
1480 NEXT pass
1490 ENDPROC
```

The following changes need to be made at lines 140 – 190 to generate random strings of random length as in the second program on the disk.

```
PRINT " Original Data ":"REM Generate
the random strings
FOR Word = 1 TO Num :REM to be sorted
W$ = ""
FOR L = 1 TO RND(70) :REM 70 can be
changed UP TO 254!!
W$ = W$ + CHR$(RND(25)+ 65) :REM
Simply upper case letters
NEXT
Words$(Word) = W$
PRINT Words$(Word)
NEXT
```

Line 400 DATA 12 also needs to be changed to any number you like!! **A**

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Trivial Pursuit

Philip Green

The Archimedes version of Trivial Pursuit has (at last) arrived. I don't mean Arctrivia, which in its original form was dreadful but was subsequently developed into quite a nice game.

Trivial Pursuit arrives on a single disc in a very sturdy plastic box (mail-resistant packaging should be made compulsory for all software producers). The instruction sheet that was provided, included all sorts of computers from Commodore through Amstrad to BBC and Spectrum with a separate addendum on how to load the game on Archimedes by using <shift-break>.

The screen shots on the instruction sheet are from other systems and the screens in the Archimedes version differ considerably from the examples given. Fortunately most items of the game are self-explanatory and with a little experimentation you can figure it all out without the manufacturer's instructions.

The disc contains 726k of program and data and, when run, uses up almost all the available space of a 1M Archimedes. Anyone out there with a 305 will have to get another half meg before you can use this game. It is certainly not multi-tasking but at least it does not upset the CMOS RAM settings.

I copied the contents of my disc to a new directory on my SCSI disc and started from there. The only thing I had to alter was the Font\$Prefix setting in the !Run file and double click on the application icon instead of using the !Boot file. When I started it on a friend's 440 with multisync monitor it failed to load, warning that minimum 1M and RISC-OS were required! It also fails to load from a 256 colour mode such as 15 although it does use Memalloc to ensure 160k of screen memory.

A new game is started by entering the names of the players (minimum one and maximum six players) and setting various options. You can choose whether or not a time limit is to be in force (maximum one minute only - ZX Spectrum offered up to nine minutes!) and whether questions are to be only in text form, sound form, graphics form or a mixture. Players can join the game at a later stage or

opt out temporarily (while dad gets the dinner ready, for example) or quit altogether. Games that would otherwise drag on too long can be saved for the next rainy day.

If you have never played or even seen Trivial Pursuit you will have no idea what fun it can be as a board game and I shall not attempt to explain precisely how the game is played. Suffice it to say that you answer questions on various subjects (Science and Nature, Art and Literature, Sports and Leisure, History, Geography, Entertainment) and get another go if you answer correctly until someone has won.

While throwing your dice you have a view of the board from above with only your token on it. When you have 'thrown your dice' and selected where to move your token, the board disappears and is replaced by a picture of a living-room with an extremely ugly little person pacing back and forth. This is TP (unless you have put him to sleep on the options screen) and if you take too long to answer he stops pacing, turns towards you and starts tapping his foot impatiently and very annoyingly! Various items of the interior keep changing places within the room each time the room appears and if you have set the time limit option a candle on a shelf burns down to indicate the amount of time left.

You do not have to enter your answer nor even get it 100% correct. You tell your fellow players your answer, click the mouse and the computer's answer appears. Your fellow players and you then debate over whether or not your answer was close enough to the original to be considered correct.

The computer game is, in my opinion, every bit as good as the board version and then adds the extra dimensions of sound and graphics: "What is this anthem?" or "What drink is usually served from a glass shaped like this?". According to the loading screen, the sound was supplied by EMR's soundsynth and a separate directory on the disc contains the sounds used. At any time during the game, players can call up the score chart. This displays each player's percentage of right and wrong answers in each of the subjects. His or her opponents can use this to good effect when deciding on the

subject of the final question by selecting the subject with the worst results so far!

The sound is indeed good and the mode 15 screens, with all text in Trinity.medium, and good use of graphics and colour, make it easy to control all aspects of the game.

I managed to crash the game by using the "player quits" option once too often – if the last player tries to quit the whole machine seizes up. When entering names at the beginning of the game, you can only use uppercase letters but the names are subsequently displayed with the first letter in uppercase and the rest in lowercase. The options screen offers the opportunity to save the game and/or start another game before actually returning to the desktop.

The instruction sheet does not mention this but if you want to hear a piece of music again before answering the question about that piece you must press the 'adjust' button on the mouse.

I have not mentioned all the features of this game but I can certainly recommend it to anyone who likes Trivial Pursuit as a board game. If you don't know the board game yet, try to find someone with a copy and play a couple of games before buying the computer game. Trivial Pursuit, the board game, is available in most if not all European languages with certain specifically national questions. The computer game does not include a question editor for tailoring or translation of the questions. Most of the questions, however, are not specifically British. £29.99 from Domark or £27 through Archive. A

Writing RISC-OS Applications – 2

Alexander Goh (Sandie the Walrus)

Creating Windows

An application creates a window by filling a data block (either manually or by template files created with FormEd) with the required information and passing it to **Wimp_CreateWindow** (SWI &400C1) which takes the following parameters:

On entry:

R1 = Block containing window definition

On exit:

R0 = Window handle

The window handle is a unique number assigned by the Window Manager and used to aid in identification of windows. That is, when Wimp_Poll returns a Redraw_Window_Request because a window needs to be redrawn, it would identify the required window by its handle. Needless to say, this should be stored in some sort of variable.

Wimp_LoadTemplate (SWI &400DB) is used to load template files created by FormEd.

On entry:

R1 = Block to load window definition into

R2 = Block to load indirected icon data into

R3 = End address of above block

R4 = Font reference handle

(use -1 if no anti-alias fonts)

R5 = Window identifier assigned by FormEd

On exit:

R2 = Next free byte of indirected icon data block

The short section of code below comes from a chess program and shows just how easy it is to create windows using templates. All it does is to open the template file and load the "progInfo" (info box) and "chessboard" (board) templates into a block which is passed to Wimp_CreateWindow. If any fine tuning of the window block is required and FormEd does not allow it (such as setting the Sprite Area Pointer), this can be done after loading the template but before creating the window.

```
DIM block 256, icon 256
SYS "Wimp_OpenTemplate",,
      "<Chess$Dir>.Templates"
SYS "Wimp_LoadTemplate",,block
      ,icon,icon+255,-1,"progInfo"
      TO ,,next
SYS "Wimp_CreateWindow",,block TO
      info_window_handle
SYS "Wimp_LoadTemplate",,block,
      next,icon+255,-1,"chessboard"
      TO ,,next
SYS "Wimp_CreateWindow",,block TO
      board_window_handle
SYS "Wimp_CloseTemplate"
```

As the window block information can be discarded once used, the application can use its normal Wimp_Poll block for this purpose. However, all sorts of mysterious errors can occur if this block is too small because the data overflows and corrupts other areas of memory. For this reason, the block should be at least as large as the largest template in the file (88 bytes + 24 bytes per icon + 1 byte per byte of indirected data).

Creating Icons

Like a window, an icon is a rectangular area of the screen but, unlike windows, icons cannot exist on their own. Every icon must be placed inside a window or in the icon bar (which is actually a window). Because of this, icon handles only have to be unique within their parent window, so the first icon created inside a window will have the handle 0, the second 1 and so on. When referring to icons, a window/icon handle pair is always required.

An icon can contain either text or a sprite and can be redrawn entirely by the Window Manager. This means that if a window contains nothing but icons, the window can be redrawn automatically by the Wimp with no help from the host program required. Although the program can re-draw the contents of a window or icon itself, this is normally only done in complex applications like Word Processors so FormEd defaults to the auto-redraw setting. For example, the Calc application on the Applications Disc 1 uses icons to create and maintain the display – there isn't a single move/draw/print etc directive in the entire program.

To reduce the programmer's workload even further, the Wimp allows both text and sprite icons (even both together) and also so-called radio icons. The Print sub-menu of the Paint application demonstrates this: the radio icons are the diamond shaped boxes which turn green when selected. The toggling is done entirely by the Wimp – all Paint does is to set the appropriate icon flags (to make the icon a radio one) and then read the state of the icons (using SWI Wimp_GetIconState) when it wants to know what has been selected.

Because of this, I don't really think that manual redrawing of windows and icons needs to be covered until a lot later. For now, I'll be making heavy use of the Wimp's auto-redraw facilities.

FormEd

If you are baffled, here is a full explanation of how FormEd works and what all the different window/icon flag and button type settings do.

Note that selecting a menu icon with a left click (select) will close the menu afterwards, but a right click (adjust) will keep it open. This feature works with any properly written application but is especially useful in FormEd as it has so many sub-menu options.

Program menu

This handles the load/save and other administrative options and can be displayed by clicking menu over the icon bar.

Info – this gives the usual info box.

Create window – selecting this creates a new, unnamed window. If, however, you enter a text string into this item's sub-menu, the window's identifier (used in LoadTemplate calls) will be set to this string. Otherwise, you can edit/set a window's identifier by clicking menu over it and using the Identifier sub-menu option.

Load templates – this lets you type in the pathname of a template file to load. Much better is to drag the file to FormEd (merge templates) because, if you double-click it, it will launch a second copy of FormEd. As there is no way of telling which windows are being maintained by which FormEd (short of quitting one and seeing which ones disappear!) this is far too confusing to be useful.

Save templates – use this to save the templates. Only named windows (those with an identifier) will be saved though. If you have already supplied a pathname you can just click on the "Save templates" menu icon itself or the OK box.

Quit – this cancels FormEd. You will not be given the customary warning message if you have unsaved template data, so use it carefully.

Document menu

This is context-sensitive i.e. the options available change depending on where the mouse pointer was located when you clicked <menu>. Some options are always available but the icon handling ones only work if the pointer was placed over an icon previously. To display the document menu, click <menu> over a window.

Create icon – this creates a new icon

Amend icon – this option allows you to adjust the characteristics of the icon under the mouse pointer. The number following the # is the handle of the icon which you will need to use in your program. The various icon flags that can be changed are:

Text – ticking this option makes the icon a text icon (contains text). The sub-menu option to the right can be used to enter the text.

Sprite – ticking this makes the icon a sprite. Use the sub-menu entry to supply the name of the sprite. Note that if the sprite is not in the Wimp Sprite Pool it will not be displayed unless it is loaded into FormEd – drag the sprite file to the icon bar icon to do this. If both text and sprite are ticked, the icon contains both (like the drive icons far left on the icon bar). Unless the icon is indirected (see below) the text must be the same as the sprite name.

Border – determines whether the icon has a border. **V & H centred** – if these are set, the text sprite will be displayed centred either vertically or horizontally. If the icon is not horizontally or vertically centred, the contents will be aligned with the left and top edges.

Right justified – aligns the contents of the icon flush with the right hand edge.

Filled – if set, the icon has a filled background, otherwise it is transparent.

Anti-aliased – use this to make the icon contain anti-alias text (using the fancy fonts). Note that the use of outline or bitmap fonts is almost as complex as windowing so avoid this unless you know how.

Needs help – if this is set, the window manager will return a Redraw_Request (via Wimp_Poll) if the icon needs redrawing (i.e. is covered and then uncovered etc). Unless it contains really complex animated graphics this shouldn't be necessary. If you want to include a picture, you can make the icon a sprite.

Indirected – normally you are only allowed 11 characters text sprite name for an icon and you cannot change this once the icon has been created. If, however, the icon is made indirected then the text will be stored in a separate block of memory which you can subsequently edit/change (this is the icon block in the above example). Also an indirected icon can contain more than 11 characters of text. The validation string lets you specify what

characters etc are allowed in the icon or the names of the two sprites to use in a radio icon etc. This is explained on pages 1184 to 1187 of the PRM.

Allow adjust – normally, if the icon is in an ESG (see below), selecting it will cancel all the other icons in the ESG. If this is set, selecting the icon with <adjust> will not cancel the others. See ESG's for more info on this topic.

Half size – if selected, any sprite used for the icon will be displayed at half size. The Filer uses this to do the Small icons and Full info modes if no special small sprite is present.

Button type – this determines how the icon reacts when you click it with the mouse. The default is 'click/drag' which means that the program will be notified about clicks or drags on the icon. If the button type is set to 'release', the program will be notified only after the icon has been clicked on and the button released. 'Auto-repeat' generates a continuous stream of events not just one, and 'writeable' allows the caret to be positioned inside the icon. If you set this, the icon should be indirected or you won't be able to get at the text! See pages 1182, 1183 for a full list of all the different options, or just experiment.

Colours – use these to select the colour of the icon's background, border and text. If the icon is transparent (not filled) the background colour is obviously meaningless and will change to EOR colour (ignore it).

ESG – only one icon in each ESG (Exclusive Selection Group) can be selected at one time. If, for example, you had a whole series of radio icons and only one of them could be selected at once (say to choose the day of the week for a diary program) you would give each icon the same ESG so that only one could be on at once. An ESG of 0 means "no ESG".

Renumber #n – icons are displayed in a strict 3D order and the ones with the high handle are redrawn after the ones with low handles, so if you had icon 0 and icon 4 overlapping, icon 0 would be covered over by icon 4. The renumber option lets you change the handle of the selected icon. If another icon already has the same handle, the two will be swapped so if you wanted icon 0 to overlap icon 4 you would re-number 0 as 4 which would swap the handles of icons 4 and 0.

Copy/move/delete icon – fairly straight forward. For multiple move or copy operations, I

recommend the use of the adjust button to save having to re-display the menu each time.

Window flags

Window flags determine the characteristics of the window. Unless the program is intended for the Arthur wimp the 'New format' option should always be ticked. The options under it each switch on or off one of the window's attributes. Note that if the window's title is subject to change (like Edit's when a document is loaded) the title icon data should be indirected.

Movable – if off, the window cannot be dragged or re-sized.

Auto-redraw – if off, the Wimp will not automatically redraw the window but rather notify the program via Wimp_Poll and make it do the work. This is useful for complex items that cannot be expressed as an icon, such as the text in a word processor or picture in Draw.

No bounds – if set, the window can leave the screen borders. Why this is of use I don't know.

Pane – if set, the window is a pane. For example, the little toolbox clipped onto the left of a Draw or Euclid window is a pane and is too much bother to be worthwhile.

User scroll – normally the Wimp scrolls 40 OS units when you click on one of the scroll arrows. If you select User scroll it will not do so, but will return a Wimp_Poll event and leave the scrolling to you. **Back** – if set, no window can go behind this one. The icon bar has this bit set.

Keys – hotkey events will be passed to this window if this option is ticked. A normal key-press goes to the input focus window (the one with the caret) but if the window has hotkeys it will be notified even if it doesn't have the caret. This is used by Task Manager to do a star command when you press <f12>.

Real colours – if set, the window will not use the desktop colour palette. If you choose to use this facility, you must write your colouring routines to work in any screen mode, so test them extensively in a 2, 4, 16 and 256 colour mode.

Colours – self explanatory

Work area – defines the maximum and minimum size of the window. If the minimum size is 0, the smallest the window can be is determined by the length of the title bar text.

Identifier – use this to enter the window's identifier for use in load template commands.

More next month... A

Help Needed and Offered

- **Colour Printing** – Can anyone offer to do colour printing of !Draw files on an Integrex Colour Jet 132 for a reasonable price? Please contact Basil Davis, 28 Joseph Crescent, Alsager, Stoke-on-Trent, ST7 2RP.
- **CPM discs** – Has anyone managed to read or write CPM 2.2 discs? Contact Peter Mercer, 10 Holmcliffe Avenue, Bankfield Park, Huddersfield, HD4 7RJ. (*Perhaps some one could modify the Sinclair QL reader on Careware 5? Ed.*)
- **Default names** – It would be nice to change the default filenames for Edit & Paint to more useful ones such as "!"Run" instead of "Obeyfile" etc. The !RunImage files have been compressed which is why they take up so little disc space. Is it possible to get hold of the compaction/decompaction routines and if so how, where and how much? Rob Davison, New Zealand
- **Hardware Project** – Keith Hodge is willing to do a constructional project for the magazine – all he wants is ideas. He may even be able to produce p.c.b.'s to make the construction more fool-proof. If you have ideas, write to him c/o Archive.
- **Masterfile II and PipeDream** – Does anybody know how to load a database in Masterfile II into the database mode of PipeDream 3? Contact Elwyn Morris, 2 Esplanade Court, King's Quay Street, Harwich, Essex, CO12 3DT.
- **Teletext software** – Solidisk Teletext users may be interested to know that some enhancements to the telesoftware have been made (too many to list in fact). Permission to release the software has been sought from BBC Soft and Solidisk although neither has replied. For further details contact Mr N Bradshaw, 711 Leeds Road, Shawcross, Dewsbury, West Yorkshire, WF12 7HR. A

MultiStore – Programmable Database?

Graham Hobson

MultiStore is a fully RISC-OS multi-tasking program which installs itself on a desktop icon bar when selected. The program takes several seconds to initialise itself and takes up a minimum of 336k of memory.

It comes with a ring-bound manual of 188 pages and two discs: one with the main programs, the other with an example database of national flags icons.

Data input

The main file windows are all RISC-OS windows of a free-form nature and when you create a file, you are able to decide where the fields will appear on the card as well as the order in which the fields are to accept data and the length of each field.

MultiStore will accept data in various formats, the main type of formats being Comma Separated Values (CSV), Tab Separated Values (TSV) and ASCII files.

When a file is first created, you have to specify not only the number of fields and their respective lengths, but also the number of records you wish to hold. Be aware that MultiStore fields are of fixed length and that should you need to amend field lengths or add additional fields, you will need to go through the relatively easy stage of transferring the records from the old file to a new one, with the additional fields added. Additional records must also go through the same transfer stage.

The capacity of MultiStore is in excess of two billion records per file, subject to memory and file storage, of course. This package is more than adequate for anyone looking for a card type of database system.

Searching and sorting

Since the software is correctly written and multi-tasking, you can actually be performing a sort on one file and searching another, while browsing, printing and loading other files and this with only slight deterioration in speed. You can perform a simple sort or a more complex sort, including placing search criteria with the use of the mouse.

You are able to make some fields "key fields" which MultiStore will use whilst searching through the records for the criteria which you have specified.

MultiStore also allows searching by the use of indexes, which are set when the file is first created. In addition to searching on indexes and through sub-sets, there is also a "Soundex" facility 'for sounds like ?'.

The fast-sort is quite impressive in terms of speed and simple to execute. It will sort a 3500 record, 740k database (that I transferred from System Delta Plus) on two criteria in under 5 minutes.

Use of icons

The video/cassette style icons (for moving forward and backward through the file to inspect the records) have been retained from System Delta Plus, although the colours are now the conventional RISC-OS colours and the icons appear in an optional toolbox pane to the left hand side of each record window which follows it when it is moved.

The thing that I found most impressive with this program is its ability to allow up to 9 icons to be installed within each card. In the demo section, a file is given showing records of different countries of Europe containing details of the capital, language, religion, size, etc, with the flag icon in the top right hand corner of each record. Think of the possibilities, using digitised images or custom sprites! The icons being redrawn whilst scrolling through the records only slows it down slightly and this demo file is very impressive.

Reporting

Reports are now simplicity itself using data from the whole file, sub-sets or from more than one file if required, with an easy-to-use dialogue box which is largely self-explanatory. You are able to get reports printed out within minutes with up to three fonts and including complex mathematical formulae – which can also generate sub-totals if required.

There are six types of reports to choose from: whole card, paged report, label and card being the main ones. Reports can be exported in ASCII format and transferred to another package such as a word-processor.

Linking files

It is possible to link files together if they have a common field, although in my opinion this does not make it fully relational.

'Fun' feature – tone dialling

One of the rather 'fun' features of MultiStore is audible tone dialling. Once a record has been set up, containing perhaps names, addresses and telephone numbers, you can drag the telephone number field onto a little telephone icon on the toolbox pane and the Archimedes will emit the necessary dialling tones. On the assumption that you have digital or multi-frequency lines (MF) you should be able to place the receiver of your telephone by the Archimedes speaker and it will automatically dial the number for you, by tone only.

Macros

Macro facilities exist within the package which will subject each new card's data to certain up-dating criteria if set. For example, you could input into a card the net cost for a product and it will automatically calculate the VAT and total, putting the results in default boxes which are not used when entering information. The macro acts at the end of the card's input sequence and will up-date it according to the criteria set.

Conclusion?

I would whole-heartedly recommend MultiStore as a more powerful version of System Delta Plus, although at a price of £300 (£250 through Archive) it might require serious thought before upgrading. Being able to make full use of the desktop environment, the improved search and sort routines, reports, graphs and macros are good reasons for upgrading, *however...*

Product support

Do Minerva fully support this product? They will send free upgrades to people should they find bugs in the programs. (The current version is 1.05.) The service and support of my questions has been excellent, so what is the problem?

Minerva are now saying that they are not, at the moment, selling MultiStore as a 'programmable database' and they freely admit that it will not be supported for programmer's use for some time to come. ("While a MultiStore Programmers' Reference Manual remains a distinct possibility, it is a low priority and is a long way off.", say Minerva. Ed.)

In several places in the manual they mention the Programmer's Toolkit, although there is no possibility of this coming out for a year or more, as

this too has a low priority. ("Maybe we will produce something some time in '91", they said to me. Ed.)

For those who wanted to program System Delta Plus, Minerva were able to supply a Programmer's Reference Manual giving the SYS calls within the modules and the parameters sent to and returned from the call. The new module does support some of the old commands, but a large number are now obsolete and there are WIMP calls replacing the old non-WIMP ones.

Last month, when I wrote the first part of my review in which I compared MultiStore with Pipedream, I thought that the programmability would give us an "Archimedes DBase", I was wrong, for the reasons I have already mentioned.

A case study

I initially thought that MultiStore would enable me to program it, using the macro commands, to enable my staff to take telephone enquiries and enter the data straight into the file. Having an 0800 telephone number means that I pay the bills for incoming calls (at 16p/minute!), so it is essential that customers are dealt with promptly and efficiently.

I thought that it would be possible to speed up the process of data entry by using the macro commands. Our prices are dependent on the type of problem the customer has (we are a pest-control company!) and also the area and locality. In addition, I tried to get the 'area' field to update, say, "P" into "Portsmouth" and from that to enter the price based on this entry. The trouble with this idea was simply that the macro does not up-date as the data is entered but only at the end of the data input.

Business needs

When the programmers have stopped playing around, what we need from the business-users' point of view is a program that has a programmable database at its heart which allows free flow data input. This must be able to be done in the order and style that the user wants and not what the programmer thinks he wants.

Also, such a database system should be fully relational. By this I mean that you should be able to enter a set of data once and the program would update other files automatically.

It would be nice to set up an accounts package and use the data for invoicing as well as have other files

which are updated to hold numeric data for the use of graphs and charts. How about seeing your weekly, monthly and annual sales figures in graphical and numeric form at the press of just a couple of keys?

(MultiStore is not fully relational in my opinion as it will not allow a name and address to be input once and then several files be updated as a result. When files are linked, it will only allow you to look at the first record it finds with common details. It does not allow you to scroll through all of them – this can only be done through the reports section.)

The database would allow a wordprocessor to extract name and address details straight into itself for inclusion within a letter, not necessarily for a mailshot, but simply so that you would have his name and address on file and it would save having to look it up and retype it.

In addition, once the letter had been finished, the wordprocessor should be able to take the header details and retain them, to allow you to look up when you had sent previous letters, the dates, reference numbers and content.

Automatic debt chasing, mail merging, mail shots, would all be part of this totally integrated, totally multi-tasking program!

An alternative?

Finally, I would like to add to what I said last month about market forces moving prices. Silicon Vision have produced a package that meets the majority of the criteria I have just mentioned, at a price of £295. From the quick demonstration I had of it at Watford Electronic's Open Day, it appears to offer the same as MultiStore but is properly relational. The product is called Office Tools, containing database management, mail merging, label printing, order processing, invoicing, accounting, share portfolio and business presentation.

Minerva are not going to be able to rest on their laurels for long – Silicon Vision's database is based on PC Fox-Base. It is fully relational although it isn't fully multi-tasking because it comes out of multi-tasking mode when sensitive data could be corrupted by other people's badly-written software. It will be interesting to see how it compares when it is released. A

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Watford Electronics' Hand Scanner

Geraint Jones & Ralph Barrett

Geraint asked if he could write us a review and Ralph sent in his comments too. This review is mainly Geraint's work but since, on his own admission (see below), he did not read the manual(!), I have added in one or two of Ralph's comments at various points.

The hardware comes in two parts, a half width podule and the scanner head which, along with the user guide are housed in a strong, attractive presentation case. Fitting the podule is straight forward but it does require a backplane and RISC-OS. The scanner head, a GeniScan model GS-4500, connects to a socket on the podule backplate by way of a 2 metre cable. Installation should present no problems to anyone with a medium sized Phillips screwdriver.

The software

Software for the scanner, written by Mike Harrison, is in ROM so that when the computer is switched on, the scanner icon is installed on the icon bar. Clicking <select> on the icon opens a dialogue box for setting the width and the length of the scan.

The maximum width is 105 mm and the length is governed by the available memory. Resolution can be adjusted to 100, 200, 300 or 400 dots per inch by a switch fitted on the scan head. The setting will be displayed on screen in the dialogue box along with the amount of memory required for the scan. Operating the scanner at the highest resolution (400 DPI) requires approximately 400k of ram. Clicking <select> on OK will open the scanner window.

Start scanning

To start a scan click on <menu> and select 'Scan' on the scan menu. The window surround will turn green and the light in the scanner head will be turned on. Place the scanner head at the top of the image to be scanned, press the start button on the right of the scan head and pull the scanner along the image at a steady speed. If you move too quickly a green light will flash in the scanner head and data will be lost. Controlling the movement of the scanner presented no problems after a couple of attempts.

When the scan is complete, the computer will bleep and the green window surround returns to a grey

colour. There is a light/dark control and a letter/photo switch on the scan head which can be adjusted to achieve optimum results depending on the type of source image.

Image manipulation

The resulting image can be zoomed and scaled to fill the screen so that the best resolution is achieved and then it can be saved as a sprite. The image can also be loaded directly into DTP or Paint but if you are running on a 1 M machine, the sprite may have to be saved first. If a printer driver is installed, the image can be printed directly. The print menu within the scanner software allows for scaling the final size of the image, you may print the whole image or just the part within the scan window, either in landscape or portrait format. The number of copies can also be specified. This method of achieving hard copy gives outstanding results but you then need to use traditional cut and paste methods (scissors and glue!) to combine the image with text or superimpose the image on a previously prepared sheet.



Bono (Superior Software advert)

The above illustration, taken from Superior Software's colour advert from the back cover of a computer magazine, gives an indication of the quality that can be produced. The image was scaled and then printed on a Brother HL8 laser printer using the facilities in the print menu.

Other options in the scanner menu are: Process – which allows x and y flip, edge detection to allow for clearing filled areas and a copy feature which can enhance and strengthen the image. Colours – which allows the change of background and foreground colours.

Application in education

The scanner has many possibilities, allowing pupils to incorporate photographs, illustrations and original artwork into desktop publishing. This could reduce the dependency on libraries of clip art files. The scanned images are superior to digitised images for DTP because they have a clean background and are not subject to contouring. However, it does not replace digitising for other applications such as image manipulation and video work.

If you need to combine images with text then this hand scanner will simplify that process and produce high quality results.

Conclusion 1

An indication of the intuitive nature of the software and hardware can be gained from the fact that, as yet, I have not found it necessary to consult the user guide. (*Slight grimace here from the editor! I hope other reviewer will read the manuals of the products they are reviewing! Ed.*)

The scanner more than meets my expectations and I cannot fault the hardware or the software. At a price of £149 + £4 p&p (+ VAT) the scanner represents excellent value for money. (Archive price £176 inc VAT & carriage.)

Ralph Barrett takes over...

Documentation

In the manual can be found a detailed explanation of various SWI (SYS) calls that enable the scanner to be used from your own programs. These calls are very powerful and a simple scanner program can be written in BASIC. Ironically, the hardest part of my program was saving the sprite to disk, as the old PRM is not very helpful on the sprite file format.

Use of memory

When the scanner is converting the scanned image into an anti-aliased sprite, it claims the current screen memory if extra memory is required. This is

a good feature on the memory starved 1 Mbyte machines, because the scanner's image buffer requires a lot of the available application memory.

Problems?

There is one very serious flaw which Ralph thought he detected in the software was that it appeared that only the scanned image currently shown on the display could be saved as a sprite. However, Mike Harrison assures us that it is perfectly possible (memory permitting) to do a full high resolution scan and save it to disc. Perhaps this is a case of the documentation not being up to scratch.

Also, Ralph notes, it is not possible to Save or (re-)Load the Scan buffer to disc. This would allow a copy of the scanned image to be saved before editing an image. If the edit was unsuccessful then the original image could be reloaded into the buffer. (True, but you could just as easily re-scan the image, says Mike, and there is a limit to how much code you can get in a ROM and how much you can get written before the customers say they want to buy the goods that are being advertised!)

Conclusion 2

Ralph's conclusion is that it is good value for money especially if you intend using it within your own programs. The scanner seems to produce the best results on two-tone line drawings (i.e. no shading) where the results can be very good indeed. I am using a KXP1124 printer (resolution 360*180). Using the scanner for 'normal' shaded pictures, using the scanner's in-built dithering is very hit and miss. However reasonable results can be obtained if anti-aliasing is applied and much trial and error is applied. Hopefully the RISC-OS version of AIM will save the day, by allowing images to be filtered to remove some of the unwanted patterning effects that dithering produces.

(*Both Geraint and Ralph seem reasonably pleased with the Watford scanner, but most potential purchasers want to know how this compares with what can be achieved with the TechnoScanner, Beebug's two Scavengers and Computer Concepts' two Scanlight offerings. Has anyone done any comparisons? Ed.*) A

ARM Code Speed Optimisation

Bjørn Fløtten

This article assumes that the reader is familiar with the instruction set of the ARM microprocessor.

The Acorn Risc Machine (ARM) is a remarkable microprocessor. It stands in a class of its own even when compared with the other RISC processors. Its unique conditional execution of every instruction together with powerful shift-instructions make a fast and powerful processor. A small example will illustrate one of the reasons why the ARM is so fast:

Consider the BASIC statement

```
IF a=1 THEN b=1 ELSE b=2
```

For a traditional microprocessor (for instance Intel's 80386), the corresponding assembly code will be:

```
CMP AL,1  
JNE label1  
MOV BL,1  
JUMP label2  
.label1 MOV BL,2  
.label2
```

Every time the 80386 does this, it will have to do one branch, either to label1 or label2 and this costs clock cycles because of the 'pipeline' architecture of all modern microprocessors. Pipelining means that while the processor is executing one instruction it is decoding the next instruction and fetching the instruction after that. But these are the instructions sequentially placed in memory, not the instructions of the execution path actually taken. So, when doing a branch, the processor must forget about both the instruction being decoded and the instruction being fetched and start all over again. The reference manual for the 80386 states that a branch takes at least 13 cycles. The CMP takes 2 cycles and the MOV, 2 cycles. This adds up to a total of 17 cycles.

The corresponding code for the ARM is:

```
CMP aR,#1  
MOVEQ bR,#1  
MOVNE bR,#2
```

and takes a total of 3 cycles. Here the conditional expression is put as a part of every instruction so that MOV bR,#1 will only be executed if the result of

CMP aR,#1 was EQUAL (zero) and MOV bR,#2 only if the result was Non Equal. Remember that with the ARM, you can decide whether or not the status flags are set after executing a particular instruction by using the S suffix. So, when there is no S in the MOVEQ bR,#1, it does not alter the status flags and so it cannot accidentally produce a Non Equal status. (The S in a CoMPare is implied automatically because the whole point of point in doing a CMP is to set the flags.)

Programming the ARM microprocessor is totally different from programming a traditional microprocessor. Those of us with experience of the 6502 may feel a little at home but those of you with experience of 8086 will soon discover that the ARM is totally different and generally much simpler and more elegant to program.

Writing working programs in ARM Assembler is not difficult, but when it comes to speed optimising, a whole new world of fascinating possibilities opens up.

Optimisation techniques

What optimisations can be done on a processor which already executes every instruction in only one clock cycle? There are two answers to this:

1. The ARM takes a long time to execute load/stores and branches (because of the pipelining discussed above).
2. The seemingly simple instruction set does have a wealth of possibilities for combining many things into one instruction.

You will have to avoid branches and cut load and stores down to a minimum. In theory this is accomplished quite easily by keeping as many intermediate results as possible in the registers and utilising the conditional executing facility for every instruction.

We have seen an example of a simple IF-THEN-ELSE. However, the really difficult conditional statement to optimise is one with AND and OR. For instance:

```
IF a=1 OR a=4 OR a=5 THEN b=1  
ELSE b=2
```

This can be transferred into:

```
CMP aR, #1
CMPNE aR, #4
CMPNE aR, #5
MOVEQ bR, #1
MOVNE bR, #2
```

The point here is that "a" is only compared with 4 if it was Not Equal 1, and so on. If one of the CoMPares gave an EQ result, then "b" is set to 1, else "b" is set to 2.

Structures like this are easy to mess up, for instance:

```
IF a=1 AND b=1 THEN c=2
```

will in ARM-code look like:

```
CMP aR, #1
CMPEQ bR, #1
MOVEQ cR, #2
```

but you cannot take:

```
IF a=1 AND b<>1 THEN c=2
```

and transfer into:

```
CMP aR, #1
CMPEQ bR, #1
MOVNE cR, #2
```

This last piece actually reads:

```
IF a<>1 OR (a=1 AND b<>1) THEN c=2
```

which is reduced to:

```
IF b<>1 THEN c=2
```

You can however take:

```
IF a<>1 AND b<>1 THEN c=2
```

and transfer into:

```
CMP aR, #1
CMPNE bR, #1
MOVEQ cR, #2
```

Following these pieces of code can be a bit difficult, especially if you are trained on a more traditional microprocessor. The possibilities are, however, endless when it comes to optimising. Actually I believe there will never be a good optimising compiler for the ARM because of this.

Let's look at:

```
IF a<c AND c>b THEN d=2
```

Your first attempt may look like:

```
CMP aR, cR
CMPLT cR, bR
MOVGT dR, #2
```

which I hope you see at once is wrong. Transferred back to BASIC this is equivalent to:

```
IF a>c OR (a<c AND c>b) THEN d=2
```

which is reduced to:

```
IF c>b THEN d=2
```

The solution here is to reverse to operands of the second CoMPare:

```
CMP aR, cR
CMPLT bR, cR
MOVLT dR, #2
```

This one is a bit more difficult:

```
IF a<0 AND b<-a THEN c=2 ELSE c=1
```

but the solution still consists of only three instructions:

```
CMP aR, #0
CMNMI bR, aR
MOVMI cR, #2
```

and you can still tuck an:

```
ELSE c=2
```

onto the BASIC statement and express this in assembler with an extra:

```
MOVPL cR, #1
```

The CMN compares the negative of the second operand with the first operand. Do not confuse CMN with MVN. MVN is MoVe Not, CMN is CoMPare Negative – there is a difference of 1 between inverting and negating an integer.

That was the use of conditional instructions but remember that there is always the possibility of escaping a branch by constructing a complex piece of code with many conditional instructions. Also, when you have to branch, branch to the routine which is least used and remember that you can have up to 4 conditional instructions which are not executed, before it is time-economical to branch. That is:

```
IF a=1 THEN b=1:c=1:d=1:e=1
```

is written as:

```
CMP aR, #1
MOVEQ bR, #1
MOVEQ cR, #1
MOVEQ dR, #1
MOVEQ eR, #1
```

but if there are five instructions to be executed if a=1, then you should write:

```
CMP aR, #1
BNE label
MOV bR, #1
MOV cR, #1
MOV dR, #1
MOV eR, #1
MOV fR, #1
.label
```

Terminating subroutines

If you have subroutines which need to restore the registers, you may have a common exit-routine like this:

```
.return
LDMFD R13!, {R0-R8,R15}^
```

which is called with for instance:

```
CMP doneR, #1
BEQ return
```

then remember that you can avoid one branch, by instead writing:

```
CMP doneR, #1
LDMEQFD R13!, {R0-R8,R15}^
```

for every exit point. The LDM looks big and complicated but it takes just as much memory (32 bit) as the "BEQ return", so you do not use more RAM with this technique.

This LDM instruction is also an excellent example of how you combine many things into one instruction. The LDM does 3 things: it restores the registers, the program-counter (R15) and the flags. Compare this with the number of instructions an 80386 needs!

Of course, often the subroutine is so long that the time taken to return is negligibly small compared to the time for the subroutine to execute, but remember that every clock-cycle helps! Do not however waste time by optimising code fragments seldom executed, concentrate on the often executed loops.

Branching in loops

Another example where you may not want to branch, is in loops. You have two possibilities here:

1. Repeat the contents of the loop the number of times it is to be executed (unrolling it).
2. Branch out of the loop when finished, instead of branching to the start of the loop for every iteration.

Alternative 1 is memory hungry, but the most effective. When you do not know at assembly time how many times the loops will be executed, you can assemble it the maximum number of times it needs to be repeated, thus:

```
RSB offsetR, number_of_timesR,
      #maximum_number_of_times
ADD PC,PC,offsetR,LSL#2
MOVNV R0,R0
MOVNV R0,R0
```

and then the loop contents, for instance

```
STR R0,[R1],#4
repeated maximum_number_of_times
.end_of_loop
```

When number_of_timesR is equal to maximum_number_of_times, the processor will jump to the first instruction in the loop. Remember that PC used as an operand, yields a value 8 greater than the address of the current instruction, hence the use of two MOVNV R0,R0's. If number_of_timesR=0 then the processor will just jump to the label end_of_loop (inserted for clarity). If there are two instructions per iteration of the loop, you will have to shift offsetR by 3 instead of 2 (multiplied by 8). Three instructions requires offsetR to be multiplied with 12. The best of doing this is:

```
ADD offsetR,offsetR,offsetR,LSL#1
      : REM Multiply by 3
ADD PC,PC,offsetR,LSL#2
      : REM Multiply by 4
```

Remember to use a combination of shift instructions instead of multiply instructions. You can for instance multiply by 320 by:

```
MOV offsetR,offsetR,LSL#6
      : REM Multiply with 64
ADD offsetR,offsetR,offsetR,LSL#2
      : REM Multiply with 5
```

and so on.

The possibility of doing arithmetic on the PC is also an excellent idea. It eliminates all specific instructions for setting and clearing the status flags, as the flags are located in the PC and are accessed via normal arithmetic instructions.

Branching out of loops

Branching out of the loop is more easy to implement. If we have:

```

MOV countR, #1000
.loop
do something
SUBS countR, countR, #1
BNE loop

```

Then if the “do something” part is very short, a relatively large amount of time is taken by the “BNE loop”. We can optimise the loop by:

```

MOV countR, #1000
.loop
do something
SUBS countR, countR, #1
BEQ out_of_loop
do something
SUBS countR, countR, #1
BEQ out_of_loop
repeat for instance 10 times
B loop
.out_of_loop

```

Now the branch goes out of the loop taking only one cycle when not executed (which happens most of the time). The final “B loop” is an overhead which is minimised by repeating the loop contents for instance 10 times. (See my article Fast Screen Clearing in Archive 2.10 p 23 for a more complete description.)

ARM3 speed decrease!

Note that these speed optimisations can have quite the opposite effect on the ARM3 processor. Firstly, you take the risk of filling the 4k cache of the ARM3 with your unrolled loops and secondly, if an unrolled loop is executed only once, the instructions will never be executed from the cache. This, in contrast to a traditional loop, where the first pass is executed at 8 Mhz from the RAM and all other passes are executed from the cache. So the conclusion is that you will have to decide which processor you want to use before using any optimisation. The best compromise would perhaps be to use the “Branch out of loops” technique. This would speed up both an ARM2 and an ARM3 (I think).

Fast integer divide

Dividing two integers by each other is a beautiful example of how you can combine all this, to make a very fast divide routine. The routine was published in SubSet in PCW December 1989 but I

repeat it here for fun. You should enter this routine with a 32 bit argument in argR and 64 bit divisor in divhiR and divloR.

```

.fast_divide
RSB argR,argR,#0
ADDS divloR,divloR,divloR
ADCS divhiR,argR,divhiR,LSL#1
SUBCC divhiR,divhiR,argR
...
repeat 31 times (with unrolled
loop!)
...
ADCS divloR,divloR,divloR
ADCS divhiR,argR,divhiR,LSL#1
SUBCC divhiR,divhiR,argR

```

and finally

```
ADC divloR,divloR,divloR
```

No, I am not able to trace the execution of this code but it gives an excellent example of the endless possibilities for optimising code for the ARM. The traditional way of dividing 32 bits by 32 bits involves 8 instructions per bit, here there are only 3, repeated 32 times and what we divide is 64 by 32 bits! Some sceptics among you will certainly rush to the keyboard, as I did, and test the routine. I can assure you it works!

The DIV instruction of the 80386 uses only about 10 clock-cycles, but that is only a 32 bit by 32 bit divide. To implement 64 bit by 32 bit on and 80386 would take a lot of time, I believe.

References:

VL86C010 32-bit RISC MPU and Peripherals Users Manual, ISBN 0-13-944968-X

ARM Assembly Language, Peter Cockerell (now sadly out of print).

Other articles:

Fast Screen Clearing, Archive 2.10 p 23.

Sprite Plotting for Games, Archive 2.10 p 24.

More Game Writing Techniques, Archive 3.1 p 40.

Coming soon:

A really fast sprite-plotting routine for use when RAM is no concern. A

Spacetech Weather Satellite System

John Eden, Phillip Eden & Barry Haines

We would not normally allow such a huge amount of space for a single review but having read the contributions made by John, Philip and Barry, and bearing in mind that Spacetech won the Secondary Schools section of the B.E.T.T. awards, I felt that it was right to make an exception. I hope you agree. Much of what Barry wrote was covered in more detail by John, but Barry gets the last word. John starts....

The purpose of a weather satellite is to orbit the earth looking at the atmosphere, then send back to a ground station images of what it 'sees'. There are two types of weather satellite in orbit above the earth, geostationary and polar. Meteorsat is a geostationary satellite which orbits the earth above the equator at a specific height such that it takes the satellite exactly one day to orbit the earth. So, when observed from the ground, it appears to be stationary.

NOAA and Meteor are polar orbiting satellites which pass close to the north and south poles on every orbit. As the earth rotates beneath them, a different part of it is seen in each orbit. The orbits are such that for a given location the satellite will pass near overhead twice a day, once going from S-N (ascending) and twelve hours later from N-S (descending). The point at which the satellite comes into the observers view is known as the AOS (acquisition of signal) and when it drops below the horizon is known as LOS (loss of signal). On an over-head pass in a good location AOS to LOS is about 15 minutes, most of which is readable. Weather satellites don't take photographs or TV type pictures of the earth, instead they use a sophisticated device known as a scanning radiometer which scans one line at a time to build up the picture. It is sensitive at different wavelengths, usually in the visible and infra-red part of the spectrum. The data from the detectors is then processed and enhanced by the satellite prior to being broadcast to the ground station.

Review context

Here in Luton a small, independent, meteorological consultancy (run by my brother) provides weather forecasting information for radio stations and newspapers as well as many other smaller clients. It is in this hard commercial environment that the Spacetech satellite package was reviewed. My review

is based on a computer user's assessment of the package while my brother's comments reflect the usefulness of the package in a commercial meteorological environment.

Independent meteorologists have no connection with the "Met Office" and therefore have no access to the wealth of forecast information gathered by them. Instead the data has to be sought by other means and then interpreted by the skill and judgement of the forecaster. A good satellite receiving system is therefore an essential tool for aiding the forecaster in this process. The consultancy uses a system manufactured by Feedback Instruments Ltd. (WSR525) which cost many thousands of pounds and some comparisons between this and the Spacetech system are made in the review.

What you get

The Spacetech package can be broken down into three parts, the podule, the software and the radio equipment. The software is supplied as two applications, animation and framestore and there are two radio receiving systems, SHF for Meteorsat reception and VHF for the polar orbiters. In addition, there is an optional grey scale card which converts the Archimedes RGB output into monochrome allowing 64 levels of grey to be displayed on a colour monitor.

Radio equipment

The radio equipment is supplied by Satellite Systems and both the VHF and SHF receivers were constructed in sturdy metal cases, which should ensure a long life in hostile environments (like schools!). The receivers are not built for outdoor operation however and should be sited in a convenient dry place. The SHF radio can be controlled remotely from the Archimedes and this is a great boon as the distance between the aerial and radio should be as short as possible to avoid signal loss.

There are two different aerials available for the SHF receiver and we chose the yagi which has a slightly better gain over the more usual dish type. This was mounted on the roof of the LBC building in central London and the radio was located 5 metres below in the air conditioning plant room. From there about 150 metres of multi-way cable was run to the basement (which is where the IRN newsroom is!!) and into the back of the Archimedes. Although it is possible to

power the radio from the computer, we decided that because of the distance involved it would be better to use a local supply for this.

The SHF receiver is able to pick up both meteorsat wefax frequencies, (1691MHz and 1694.5MHz) and this it did faultlessly. The signal we received was affected by the rather close proximity of a high powered VHF transmitter, (too many people competing for the limited roof space) and this caused a slight herringbone effect on received pictures, but was tolerable. This problem is unlikely to be experienced by other users!

A crossed dipole aerial for the VHF receiver was mounted on the roof of our Luton office with the receiver in the main office below. I have to say that our location is far from ideal for receiving the orbiting satellites, with the office built on a hillside to the east and a wooded area to the south and west AOS to LOS is not as good as we had hoped. It is recommended that the Archimedes be positioned as far away from the VHF receiver as possible to avoid interference and we found that a couple of metres was enough to prevent any problems.

That aside, the Archimedes is the noisiest computer I have come across for emitting RF interference. Even with the machine located in another room it caused problems on some of our radios and when switched to a multi-sync mode, blotted out one frequency completely!

The VHF receiver worked well and scanned five channels allowing reception of NOAA and METEOR satellites. With an appropriate squelch threshold set and the software set to automatic, it was possible to leave the system to grab pictures on its own. Although our location is not good, the images received were of excellent quality with no drop-outs during the main part of the pass.

The podule

As my knowledge of electronics is only very basic I don't feel able to comment in depth on the podule other than to say that it appears to be a well constructed device. A phono socket and 25 way D type connector are provided on the backplate to allow connection to the outside world. You can connect the output of your receiver to either of these. In addition, the 25 way connector provides four TTL lines, (which can be used to channel change a suitable receiver remotely) and a 12 volt output line. Two versions of the podule are available, one for Archimedes 300 and

400 series computers and the other for A3000 machines.

Meteorsat animation software

The animation software allows the selection, capture, storage and animation of Meteorsat images and depending on the memory available in your machine, it can animate up to 200 frames in extended mode or 58 frames in hi-res mode. Compare this to our expensive Feedback system which manages to animate just 3! The animation software is not a true RISC-OS application and doesn't install itself on the icon bar. When started, it takes over the whole machine since the ARM's full attention is required for the digital signal processing. All available memory is grabbed to store as many images as possible. When you enter the animation software, you are presented with a menu which allows you to select one of the three operating modes. These are Extended Animation, Hi-res Animation and Utilities.

Extended animation

The main 'run' screen in this mode consists of a large display area covering about 85 per cent of the screen and a control panel down the right hand side which covers the remainder. Any frames you have selected from the timetable can only be decoded and displayed while you are in this screen. Each frame is stored in memory and when this is full, the oldest frame is overwritten so the sequence always remains current. It is possible to set up a zoom area and, if this is done, the defined area will be decoded at full display size. It is not possible to zoom in on a frame which has already been decoded. A backdrop may be loaded into the display window to help identify land features and the decoded frames will be superimposed over this.

The control panel allows you to alter the default palette of sixteen grey shades to any of the 4096 colours available by the now familiar means of dragging RGB sliders. Buttons are provided to start and stop the animation sequence and a slider is provided to control the speed. In addition there is 'frame winder window' which resembles a clock face with one large hand. By holding down <select>, the hand can be dragged clockwise or anti-clockwise to allow manual manipulation of the animated sequence. When the software is decoding a frame, animation stops and this window is replaced by capture status information. The software calibrates itself using data sent at the start of each frame ensuring consistent results. At the top of the panel a display

shows the current time as read from the Archimedes real time clock. It is essential that this is set accurately to GMT as Meteorsat frames are broadcast to a strict timetable. Two further buttons allow access to the timetable screen and command screen.

Clicking on the timetable button replaces the 'run' screen with the 'timetable' screen. This shows the current Meteorsat dissemination schedule for channel one and it is from here that you select the frames you wish to decode. You can select frames singly, or all the frames of a particular group can be selected in one go. Clicking on the CH2 button brings up the channel two schedule and selections can be made from this in the same way. If you have a remote controlled receiver, the correct channel will be selected automatically. A full screen map can be displayed, showing the codes used in the schedule and the areas each frame covers. Date stamping may be toggled on or off and if enabled, the decoded frame will be displayed with its received date and time superimposed at the bottom. Auto printing can also be toggled and, if this is enabled, each frame will be printed out after it has been decoded.

The command screen gives you access to the operating system and allows you to perform various house keeping tasks. You can load and save palette files, schedules, backdrops and setup files as well as all the data collected in a session. I found saving a session was a bit fussy, requiring the different file types to be saved on a specially structured disc in a specific way. Re-loading the session was quite simple though, as loading the session data caused all the supporting files to be re-loaded automatically.

The command screen also gives information about the current session, showing how many frames are stored and how much memory is free as well as more technical things. A slider is provided to adjust the percentage match of sync signal required to start the software decoding. Two further sliders allow a decoding bias to be set up allowing the user to determine the relationship between the black and white levels in the decoded image. This is a very powerful feature and using this technique it is possible to decode only the most significant detail in a frame, or enhance images by boosting their contrast.

Hi-res animation

Operation of this mode is almost identical to extended mode. However, frames are decoded with greater detail and hence require more memory. The trade off

is greater resolution against a shorter animated sequence. Below a certain speed, the animation is combined with a cross fade and in-betweening technique which gives some pretty impressive animations, with no judder or jumping. A palette giving 64 grey tones (on a suitable monochrome monitor or with optional grey scale card) can be used in this mode and this adds further detail to the already excellent animation. I was most impressed with this mode. The quality of the decoded images and the very slick animation highlighted the limitations of our Feedback system, the latter only being able to animate 3 images with 16 grey tones and not a cross-fade in sight let alone in-betweening!

Utilities

The final option from the main menu provides a selection of utilities for use with the animation modes. Some basic drawing routines are provided to allow backdrops to be created for use in extended mode and further utilities are provided for editing the timetable and creating new greyscale palettes for use in hi-res mode. Previously saved frames can be turned into sprites allowing images to be exported to other applications for further processing.

The framestore application

Framestore is a RISC-OS application which can be used to decode frames from almost any satellite format. It provides the user with a very powerful means of decoding complete frames in full resolution and allows them to be manipulated in a variety of ways with the greatest of ease. It can also be set up by the more experienced user to decode only specific parts of an image.

Although this is a RISC-OS application, it has not been possible to implement the standard window system or filing system filers. The reasons for this are quite simple and are detailed in the manual. Briefly, implementing the WIMP would not have left enough memory for the images. Also, the digital signal processing techniques used to decode the real time data require the full attention of the processor and with the extensive use of fast interrupts, the ARM simply has nothing left to give!

Running framestore

Clicking on the application icon on the icon bar starts framestore which takes over the whole machine. Any applications already loaded are preserved with their workspace intact so they can be resumed when you

return to the desktop. Framestore runs in modes 15 and 21, the latter giving a high resolution display with 640x512 lines. Almost all the screen is taken up by the decoding area with just a single status line at the bottom and a strip down the right hand edge of the screen containing a palette and control panel.

Clicking <menu> brings up the main menu which gives access to a whole host of options and configurable settings. Moving the pointer outside the main menu window causes it to be removed from the screen and when I was working quickly, I found it quite easy to do this accidentally. This can become quite annoying, especially when you are operating in mode 21, as the removal and re-painting of this menu is quite slow.

Selecting 'Disc Files' leads to a further sub menu from where the user can load, save and delete data and other supporting files. Setup files for all the known image formats and satellites have been thoughtfully provided by Spacetech to allow the software to be used with the minimum of fuss. Most users will venture no further than to load one of these and then get on with the business of decoding. Like the animation software, Framestore also uses a specially structured disc for saving and loading files but discs which have been structured for use in one package can't be used in the other!

For the more adventurous, very powerful tools are provided to allow the adjustment and fine tuning of the replica correlator and the user may also define new replica waveforms. All incoming data is fed through the correlator and line synchronisation takes place when a match with the replica occurs. Since it is very unlikely that a 100 per cent match will be found, a threshold can be set allowing near matches to trigger sync. Tools are also provided to allow the framing parameters to be altered. These determine how many pixels to grab, pixels per line, trigger delay and the padding required etc. This really is very sophisticated, state-of-the-art stuff, making the system very flexible. These routines are what taxes the processor and you would not be able to implement them so fully on a lesser machine.

Having decided which satellite and image format you are going to receive and having loaded the relevant setup file, you can now start to decode some images. Clicking on the decode button on the control panel starts the process. The panel allows various settings to be altered dynamically while images are being

decoded and the effects of any alterations can be seen straight away on the incoming image. Alterations may be made in this way to the black and white levels, correlator filter and threshold, trigger delay and pixels to grab. As alterations are made, the status line reflects the new value and you soon learn the best settings for the various parameters.

All of these settings may also be adjusted from the main menu. The manual clearly explains how they all interrelate and how to calculate the values for the various formats. An option to allow the software to auto calibrate the black and white levels from the satellite data is also provided. Using this ensures that the decoded image contains the correct dynamic range. All the settings can be saved in a setup file and, as I said earlier, a range of files have been included with the package.

Once you have an image in the machine you can start to play around with it. Using the mouse, you can mark areas of the image with a bounding box and zoom in, zoom out, flip, rotate, invert, pan, scroll, in fact just about anything. Altering the aspect ratio is simply a matter of stretching the box in one direction or the other and zooming in and it all happens incredibly quickly! Very powerful paintbox routines are employed which allow you to colour the image or to do contrast stretches and density slicing. Other features include 'zit' removal, cross-fade and an adjacent line copy routine (useful for eradicating drop outs).

What I particularly liked was the ease with which contrast stretching can be done. You simply point and click on the darkest and lightest areas in the image and the software works out the range of density levels, setting two markers on the palette to indicate this. Using the paintbox, you select the full range of greys and then spread these between the two markers on the palette. The image updates and that's all there is to it! This is invaluable for revealing detail that might otherwise be missed, especially on images which have only a narrow band of densities (such as low light visible images).

Framestore works to a resolution of 256 density levels for each picture point and if you have the optional grey scale card, 64 levels of grey can be displayed across this range. With the standard Archimedes monitor, the quality and resolution far exceeded the results we achieve with our Feedback system and when coupled with a multisync monitor, the images have a near photographic quality.

Framestore is packed with so many features that a review like this can't hope to do it justice. Suffice it to say that everything you need to decode and manipulate satellite images has been included and a good deal of very powerful routines not normally found on cheap satellite decoders (and rarely on expensive ones!) have been included too.

Documentation

Two A5 manuals are supplied with the Spacetech package, one for the animation software and one for Framestore. I could not fault the manuals on their content, both having step by step instructions on using their respective packages, as well as detailed explanations of the more complex techniques. The Framestore manual, for instance, devotes a whole chapter to customising the replica correlator and framing parameters and the descriptions are such that most people should find no difficulties in understanding them, despite the complexity of the subject.

I do have a couple of criticisms. Firstly, I found the size of print a little small, making it quite difficult to flick through. Flicking through the animation manual is an unfortunate necessity, as it has neither an index nor a contents. Secondly, the illustrations and diagrams have not reproduced very well especially in the animation manual. Don't get me wrong, they are readable, but they could have been a lot better!

Conclusion

I have to say that the time and effort Spacetech have lavished on this product shows. It has been under development for 18 months and on field trial for the last twelve. The power and speed of the Archimedes has been harnessed to provide a very powerful, yet easy to use decoding and image processing tool. The digital signal processing techniques used and the huge range of imaging tools available, are hitherto unheard of in such a low cost system. The result is a product of professional standards, which Spacetech can be proud of.

So who is going to buy it? Mainly I suspect the educational market, where it has huge potential across the curriculum. (It won the Secondary School section of the Education Technology Awards at BETT this year). The list of related subjects is long; geography, mathematics, physics, engineering, radio propagation, remote sensing, to name but a few. However, perhaps the highest accolade for Spacetech, is that three television companies will shortly be using

this package to receive and broadcast satellite sequences during their weather forecasts.

A meteorologist's view

Philip Eden

My impression of this Spacetech system is simple to describe. Compared with the various industry-standard systems I have previously used, it is better and cheaper. Sometimes you can say one and sometimes you can say the other; very rarely both.

An operational meteorologist (as distinct from a research meteorologist) uses satellite images in three ways. The most important, arguably, is the most fundamental and that is to gain an overview of the cloud-patterns affecting a particular area. When satpix first became available, forecasters found this a tremendous advantage – the images filled in the gaps in the network of orthodox weather observations. It is not entirely as simple as that, though, because you have to remember you are looking down on the cloud patterns and what you see may be 10 km above the earth's surface; some experienced forecasters still forget this at times!

Secondly, the meteorologist will want to look in detail at specific areas, to assess the structure of a particular patch of cloud or to determine the precise location of the edge of a cloud-bank or perhaps the extent of fog or snow-cover. Thirdly, that sequence of images familiar to viewers of certain TV channels enables the forecaster to assess the speed of movement of cloud-systems and also the speed at which they are developing or dying out. All these requirements are very well catered for in Spacetech's product.

The combination of the animation software and the processing power of the Archimedes provides an embarrassment of riches. Frankly, a sequence of 50 images is simply too long and too complex for regular operational use but it's great to look at! To be able to slow down or even stop the sequence to examine a particular development is a great advantage; another is the ability to highlight a particular grey-shade by adding colour. Even so, there is one improvement that would be worthwhile – the option of adding a pause at the end of the sequence, before it starts at the beginning again. That would help the forecaster assimilate how far the weather-patterns have developed by the time of the most recent image.

The framestore software caters for the need to investigate cloud details at the highest available

resolution at leisure. There is no restriction to the ability to zoom in or out and, if you really want to, you can actually look at individual pixels. The ability to alter the aspect ratio is also important especially when looking at Meteorsat images. Meteorsat actually looks at the British Isles obliquely, but this system allows the image to be stretched to provide the user with a geographically correct (almost) view of the country.

It is a shame that you can't use framestore when the system is operating animation but that would be asking too much. If anyone else wants to use Spacetech's offering professionally, the price is such that you can afford to buy two lots of software and run them side by side. I do!

How do I receive the signals?

Barry Haines

To receive the polar orbital satellites is fairly straight forward. There are a number of receivers around, either

built or in kit form, with prices up to about £150. If you have a receiver that tunes 137 to 138 MHz it will need a minimum bandwidth of 30 kHz. The aerial can be just a simple pair of crossed dipoles. To receive Meteorsat then you will need a down converter which will set you back another £250 and 1 meter dish (although you can get away with a 8ft loop yagi). For those who would like some more information you can write to me or contact on Packet radio:- G8FAT @ GB7BST.

Alternatively, contact the Secretary of The Remote Imaging Group: Phil Seaford, 14 Nevis Close, Leighton Buzzard, Beds LU7 7XD.

The following prices from Spacetech include VAT:

Podule & software	£295
SHF receiver	£330
yagi antenna	£199
VHF receiver	£295
VHF antenna	£34.44 A

Matters Arising

• **Central Heating Calculator** – The contact address for the commercial version of the Central Heating Calculator program that appears on the Shareware 12 disc is in fact 39 Knighton Park Road, Sydenham, London, SE26 5RN not 29 as was published in Archive 3.1 p 2. Apologies to Mr Holden for the error and thanks his local postman who was clever enough to intercept the mail.

• **Charity Sale Items** – Many thanks to all of you who have sent second hand software (and hardware in some cases!) for sale in aid of charity. Please keep them coming. If any of the items you send in do not appear on the list, don't worry – we are not selling them as new goods and pocketing the profit! What often happens is that people drop into the office and ask what is available, so some of them are sold before the next magazine appears.

If you want to buy any of our charity items, please, if at all possible, ring to check availability. If this really is not possible, send a separate cheque for each item and then if they have already been sold, we will destroy the cheque but I am afraid that we do not have time to write and tell you unless, of course, you are ordering other goods at the same time. Charity Items available now:

Minotaur	£4 minimum
Hoverbod	£7 minimum
Missile Control	£7 minimum
Presenter	£8 minimum
Artisan	£12 minimum
Artisan Support	£5 minimum
Graphic Writer	£10 minimum

MaxGammon (desktop Backgammon) £3 min

If anyone needs them, we have quite a number of IEC mains leads with 13A plugs – just like the ones on the Archimedes. A couple of pounds each for charity?

• **Sorting routines** – Various of the DIM array size% statements in Ian Smith's article last month should, we think, have been DIM array 4*size% though we haven't had time to check that with Ian but it sounds reasonable as he is dealing with size% words, each 4 bytes long. It won't matter if you err on the side of dimensioning too much space, but if you dimension too little, the results could be spectacular. A

More Shareware Available

There are now a couple more Shareware discs available. The first, №21, is another "Best of SID" disc – AIM image manager, utilities to convert files between AIM and Watford digitiser format, ChangeFSI (changes graphics files between different formats), QRT ray-tracer plus some sample image files for use with ChangeFSI.

The second, №22, is our first DTP disc, mostly compiled by Ian Lynch. Contains Impression utilities: draw file of key strip, backup program, letter dating and access to extended characters. The rest of the disc is made up of line art for inclusion in DTP: 8 draw fonts (not outline fonts), 64 signs, map of Africa and 34 various colour and mono pictures. A

Fact-File

(The numbers in *italic*
are fax numbers.)

- 4th Dimension
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